

Report to

Department of the Army
New England Division
Corps of Engineers

on

ROUGHAN'S POINT SOCIAL SURVEY
FOR
REVERE COASTAL FLOOD PROTECTION STUDY

CEM Report No. 4280-01-724

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1.0 INTRODUCTION

1.1 Overview

The Roughan's Point area of Revere, Massachusetts, was severely impacted by coastal flooding during the Blizzard of February 1978 and, to a lesser extent, at other times. Economic damages, personal injuries and other social disruptions resulting from coastal flooding events in Revere have motivated the conduct of the Revere Coastal Flood Protection Study by the New England Division of the Corps of Engineers. This study is authorized by the Water Resources Planning Act of 1965 and a Congressional Resolution adopted 12 September 1969. Details on the study are presented in the Reconnaissance Report (COE, 1980).

One aspect of the Revere Coastal Flood Protection study involves communication with citizens who are affected by flooding or who might be affected by possible flood damage reduction measures to be recommended and implemented. The planning process consists of sequential stages involving reconnaissance, intermediate plan development and detailed plan development. Within each stage, functional tasks include problem identification, formulation of alternative plans, impact assessment and evaluation. At each stage, communication between Corps planners and the public is required to ensure that recommended plans reflect the needs and desires of affected citizens. This social survey investigation relates to the intermediate plan development stage.

The Roughan's Point Social Survey is one mechanism for communicating with citizens of the Roughan's Point neighborhood. The objective of the survey is threefold:

1. To collect data describing residents' experiences with flooding.
2. To collect data describing activities individuals have taken to protect themselves and their homes from flooding.
3. To determine preferences for alternative flood control and flood damage reduction measures.

1.2 Survey Instrument

The primary survey instrument used to collect information is a mailed questionnaire (Appendix A). The questionnaire is divided into three sections according to the survey objectives listed above. A total of 465 questionnaires was mailed to residents of the Roughan's Point neighborhood, using addresses obtained from city census data and town voting lists. The questions and survey responses are discussed in Section 2 below. Interpretation of results follows in Section 3.

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many
up*

Included with the questionnaire was a cover letter and an informational brochure. The cover letter (Appendix B) was intended to introduce and summarize the purpose of the survey, to cite study authorization and to indicate how the survey will be used in the planning process. Civic group representatives also were asked to urge citizens to respond to the questionnaire.

The information brochure (Appendix C) was prepared and mailed with the questionnaire to provide background information on the Roughan's Point flooding situation and flood damage reduction measures. It was hoped that the brochure would facilitate more informed survey responses through explanation of terms. In addition, the brochure and accompanying cover letter provide relevant information on the conduct of the Revere Coastal Flood Protection Study.

A stamped, self-addressed envelope was provided for return of completed questionnaires.

2.0 ANALYSIS OF QUESTIONNAIRES

2.1 Analysis Plan

The approach for analysis of returned questionnaires involved development of a coding dictionary for classifying responses (record layout), actual coding of the responses, and transcription of coded responses into machine-readable form for the subsequent computer analysis of data. Various error checking procedures were developed and implemented during the coding of responses to ensure both accuracy and consistency of data to the greatest extent possible. Initial computer runs were carried out to further check the consistency of responses. For example, if individuals responding as not having been flooded also reported specific details pertaining to the nature of their flooding experiences, the case was flagged and, if possible, the discrepancy resolved. Otherwise, inconsistent responses were excluded from the analysis on a per-item basis.

Data were analyzed using Program P2D of the BMDP Statistical Software Series (BMDP, 1979). Analyses performed included:

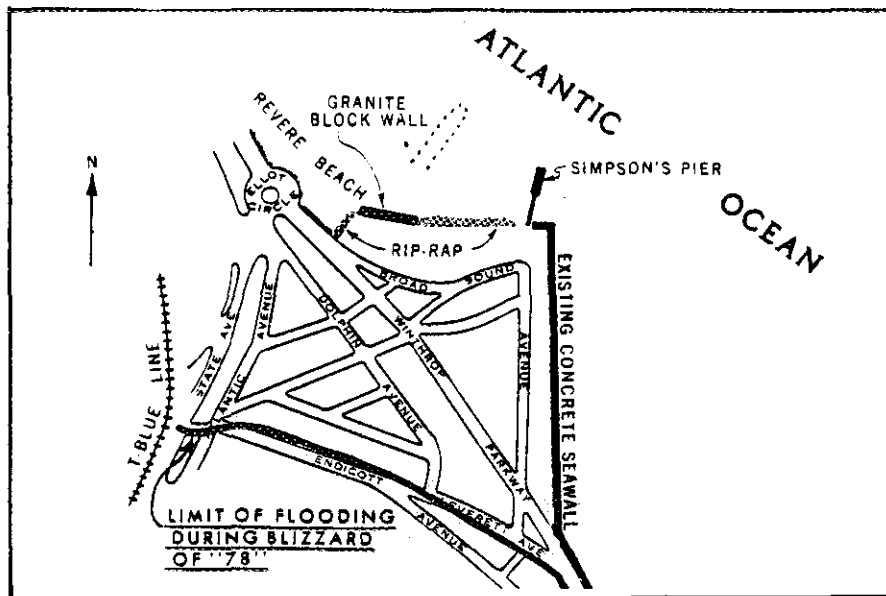
- Data screening and description
- Frequency counts
- Plots and histograms
- Summary statistics (mean, median, mode, standard deviation, half interquartile range, range, skewness and kurtosis).

With few exceptions, the results of the analyses reported in the next section consist of univariate frequency counts, percentages, and plots and histograms of the responses to the questionnaire items. Section 3 of this report summarizes select results and interpretations of the survey results.

As is true in all surveys, one needs to assess the extent to which the reported experiences and opinions of those returning questionnaires are representative of the population at large. One frequently cited measure is the survey response rate. For this survey a total of 465 questionnaires were mailed directly to Roughan's Point residents. A period of four weeks was allowed for return of the questionnaire. A total of 141 questionnaires (30 percent) eventually were returned. Of these, two were not completed and two were received too late for inclusion into this report. For analysis purposes, then, the adjusted response rate was 29 percent, which is considered to be quite good for surveys of this type.

2.2 Respondent Characteristics

In this section, responses to the survey are presented in both a written and a graphical form. All percentages used are based on the number of persons who responded to the particular question being discussed, and are rounded to the nearest whole number. Also, in cases where multiple responses to a question were allowed, percentages do not sum to 100.



Map of Roughan's Point

Location

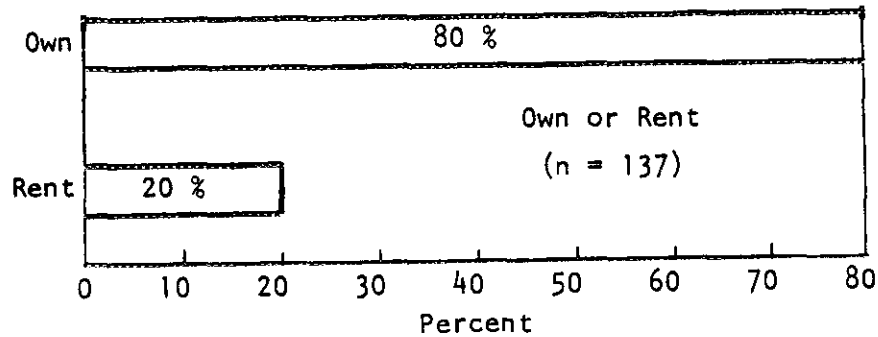
In an attempt to determine whether or not the sample from which findings are reported is biased, one can examine the geographic distribution of those responding versus those not responding to the survey. The following table depicts the differential response rates for two individual geographic groupings as delineated on the map. Groups 1 and 2 are arbitrarily defined, and can be distinguished by their approximate distance to the shore (Group 1 is closer). Their respective response rates clearly suggest that those residents closer to the shore—and by inference, likely to experience more frequent and serious flooding than those more far removed—are moderately over-represented in the sample.

RESPONSE RATES BY GEOGRAPHIC GROUPING

Group 1: Near-Shore (Winthrop Parkway and East)			Group 2: Further from Shore (West of Winthrop Parkway)		
<u>No. Sent</u>	<u>No. Returned</u>	<u>%</u>	<u>No. Sent</u>	<u>No. Returned</u>	<u>%</u>
142	61	43	323	76	24

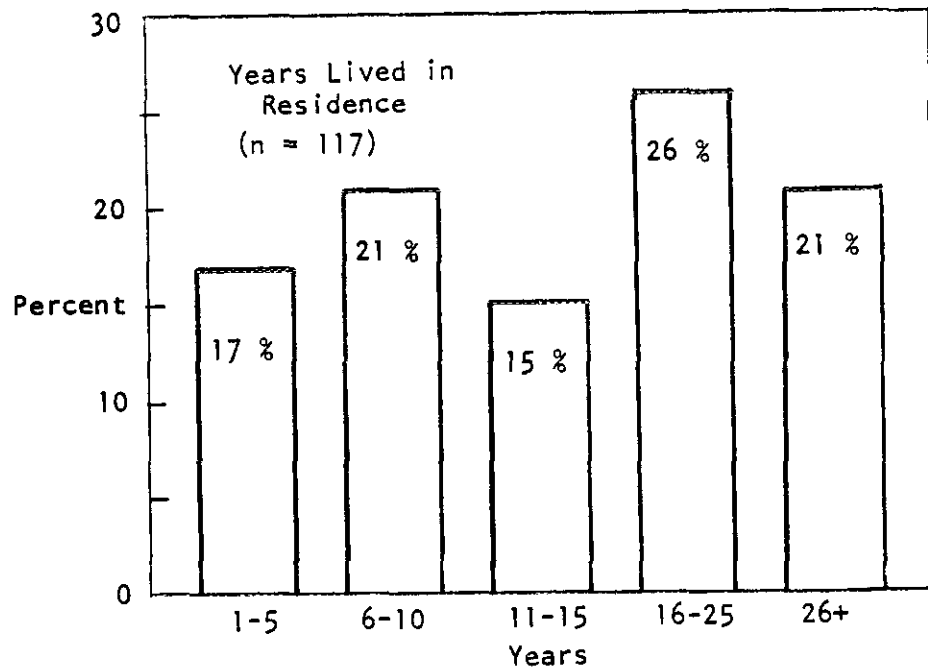
Ownership (137 responses)

Only one-fifth of the Revere residents who responded to the survey rent the places they live in. Four-fifths are homeowners. One former homeowner is presently a renter--still in Revere--because of the extensive damage the Blizzard of '78 caused to his home.



Length of Residency (117 responses)

Considering the 117 renters and homeowners who answered this question collectively, we find that almost one-half (47 percent) have been living in the same place for more than 15 years: 26 percent have been living in the same place for 16 to 25 years, while 21 percent have been living in the same residence for 26 years or more.

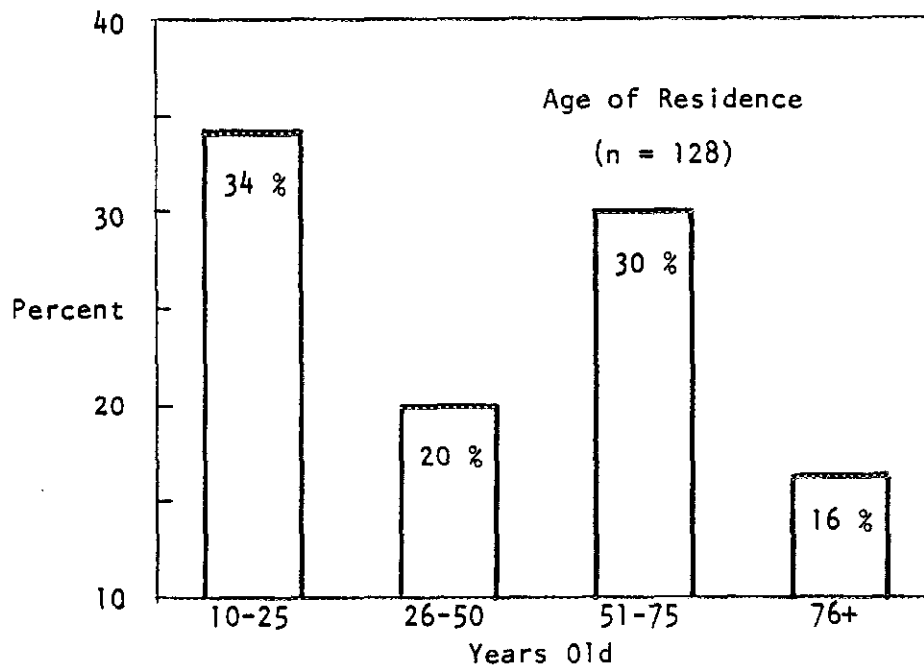


Use of Residence (137 responses)

All but one of the survey respondents lives in Revere year-round. The single seasonal respondent resides in Revere from April to November of each year.

Age of Residence (128 responses)

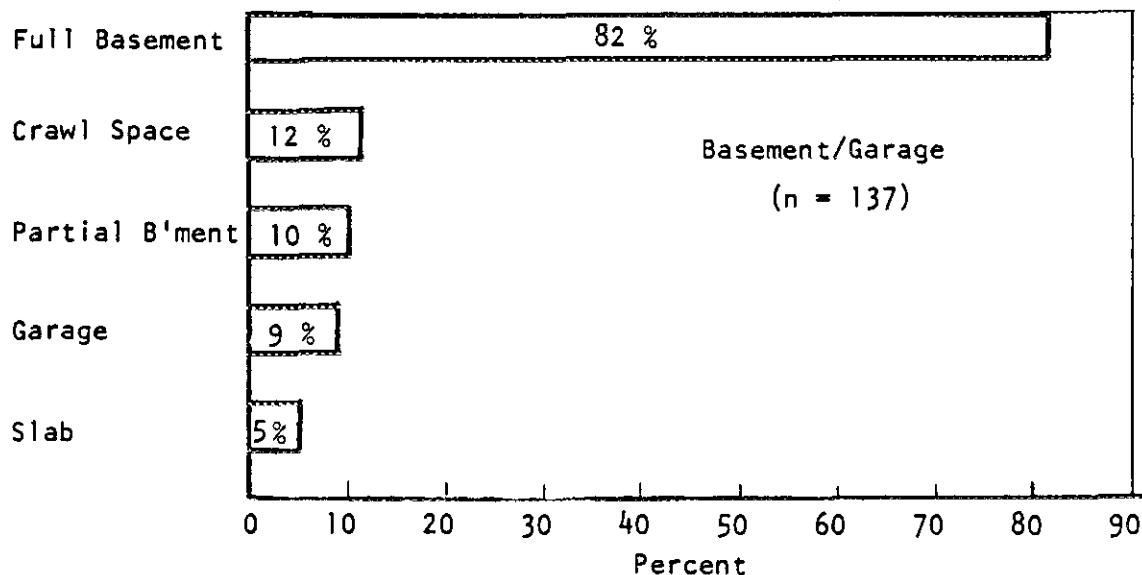
Almost half of the residences (46 percent) of respondents are more than 50 years old. In addition, none were less than 10 years old.



Basements and Garages (137 responses)

Most respondents (82 percent) have full basements beneath their homes, compared to those with basements under part of the house (10 percent) or with crawl space only (12 percent). Fewer than one-tenth of the 137 respondents (9 percent) have homes with garages; many persons wrote in "car" as part of their response to the survey question, "What was damaged?"

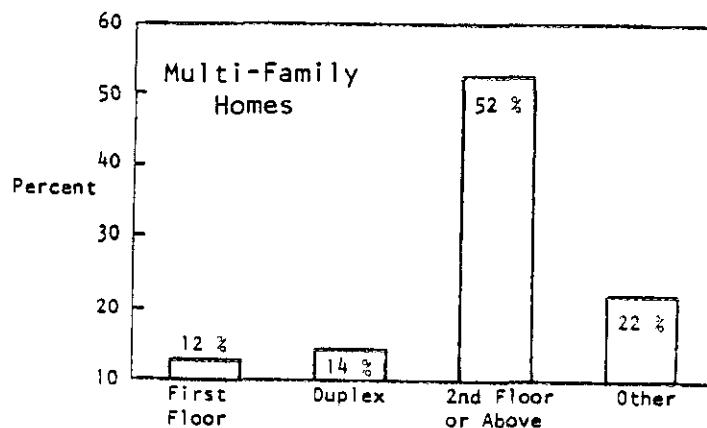
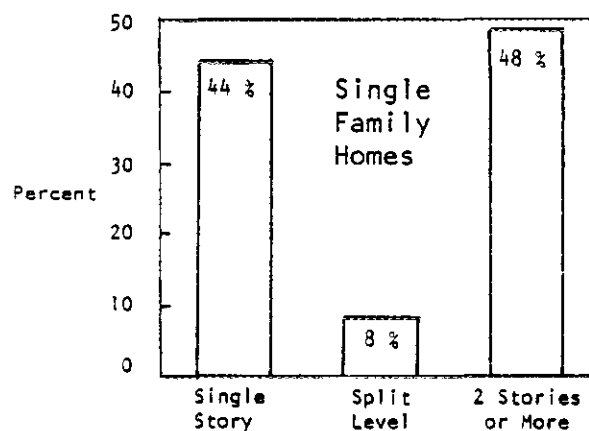
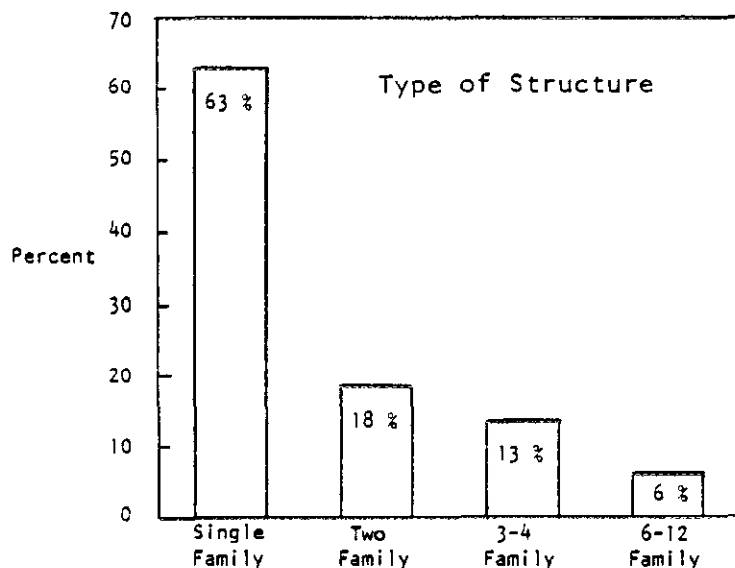
There were 23 different combinations given in response to a write-in question on basement use. Major uses included storage, recreation, laundry, utilities, and workshop. A few basements had been turned into apartments, and one basement housed a women's apparel store.



Note: Percentages do not round to 100, since multiple responses were allowed.

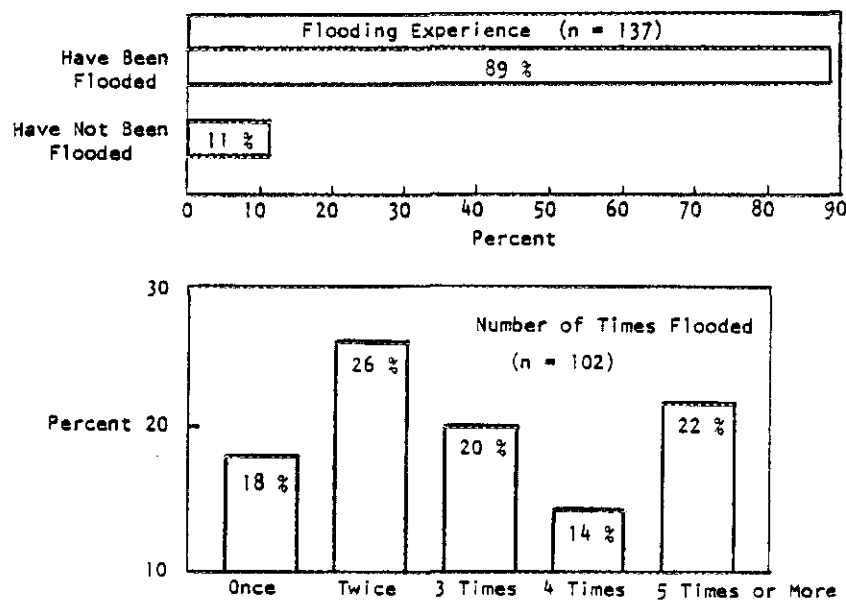
Type of Structure (133 responses)

More than half (63 percent) of those who answered and returned the survey live in single family homes, which are almost equally divided between single story homes (44 percent) and two stories or more (48 percent). The greatest number of those occupying multifamily units live on the second floor or above (52 percent), while the number of those living on the first floor or in a duplex are almost identical—12 percent and 14 percent, respectively.



2.3 Flooding Experiences of Residents

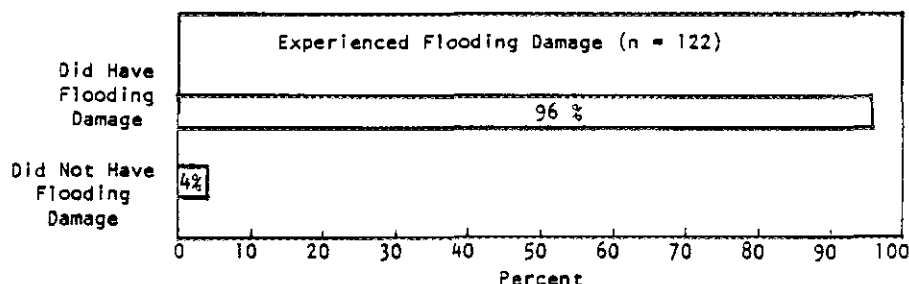
Approximately 90 percent of the 137 respondents indicated that their homes or properties had been flooded. More than one-fifth of these (22 percent) had been flooded five times or more. There is a statistically significant positive correlation between length of residence and number of times flooded ($r = 0.322$; $p < 0.01$). In other words, the data indicate that, given an increase in respondents' length of residence, there is a corresponding increase in the number of times flooded.



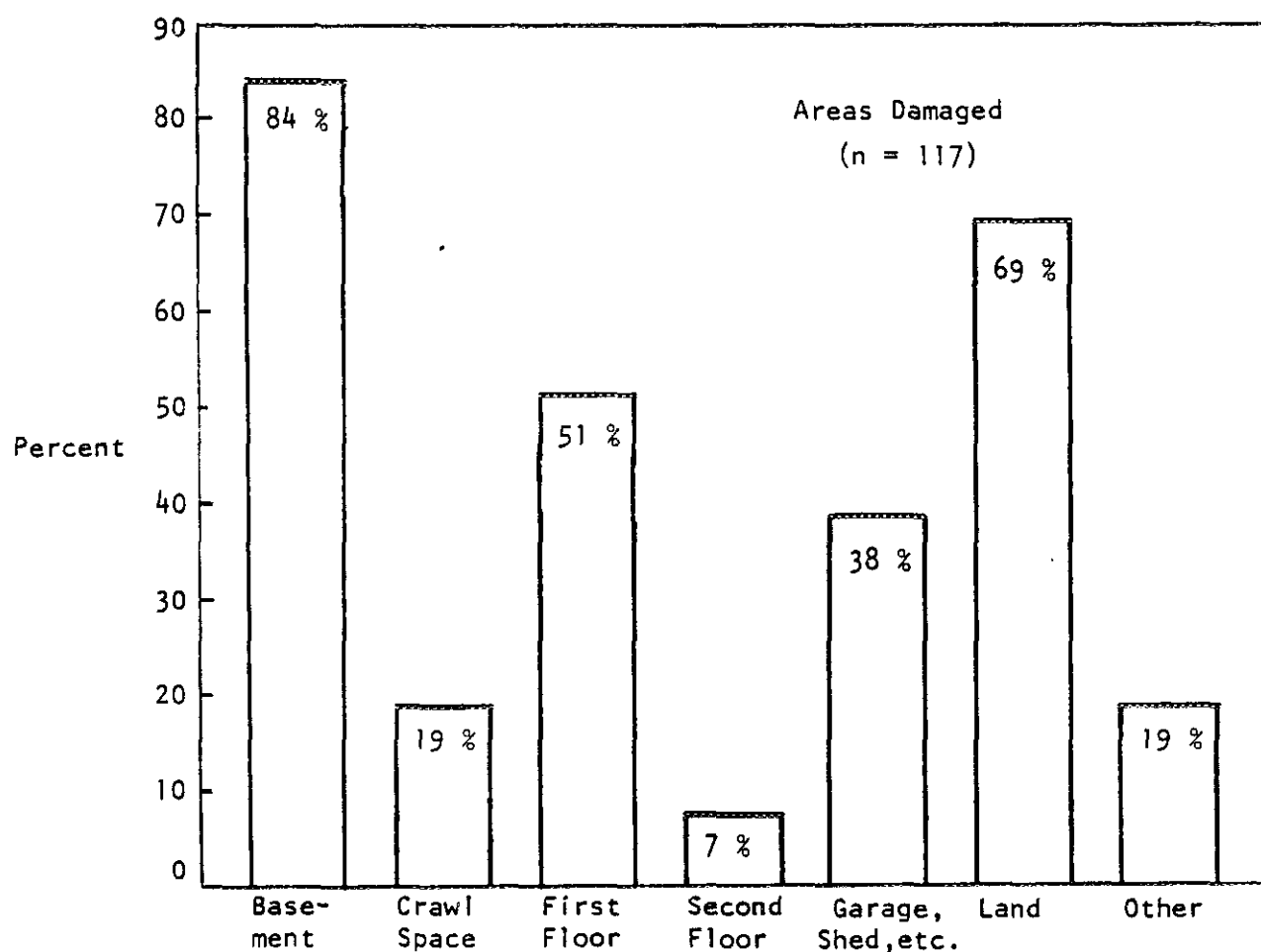
Of the 122 respondents who reported flooding experiences, 104 answered the questions on the month and year of their most severe flooding experience. Of these, all but three indicated that February 1978 was their worst experience. Three other dates were reported by one person each: March 1970, January 1979 and February 1980.

Location of Flooding Damage (122 responses)

Flooding damage was widespread among the 122 survey respondents who experienced flooding. Of these, 117 persons (96 percent) reported some flooding damage.



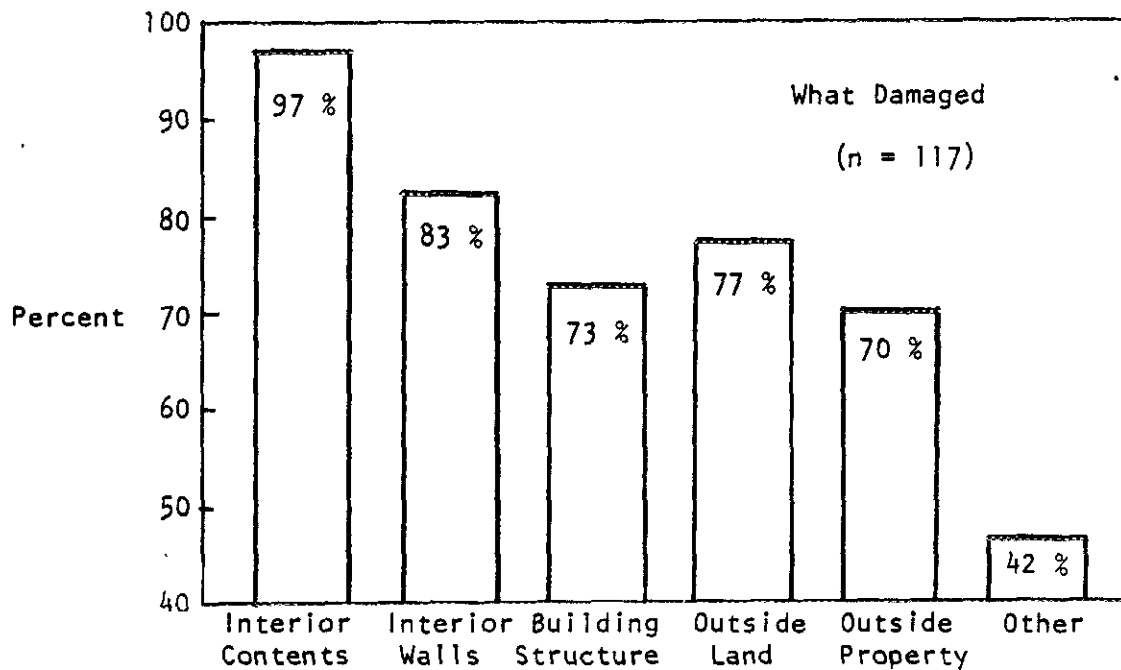
For the 117 who experienced flood damage, more than four-fifths (84 percent) reported damage in their basements. (Respondents were asked to exclude flooding caused by plumbing problems such as a leaking hot water tank.) Two other major areas of flood damage were land surrounding residences (69 percent) and first floors of residences (51 percent). In addition to the six choices presented in the survey, respondents wrote in several other areas which sustained damage. These included major damage to foundations of homes (flooding moved one house from its foundation) and swimming pool damage.



Note: Percentages do not sum to 100, since multiple responses were allowed.

Type of Flooding Damage (117 responses)

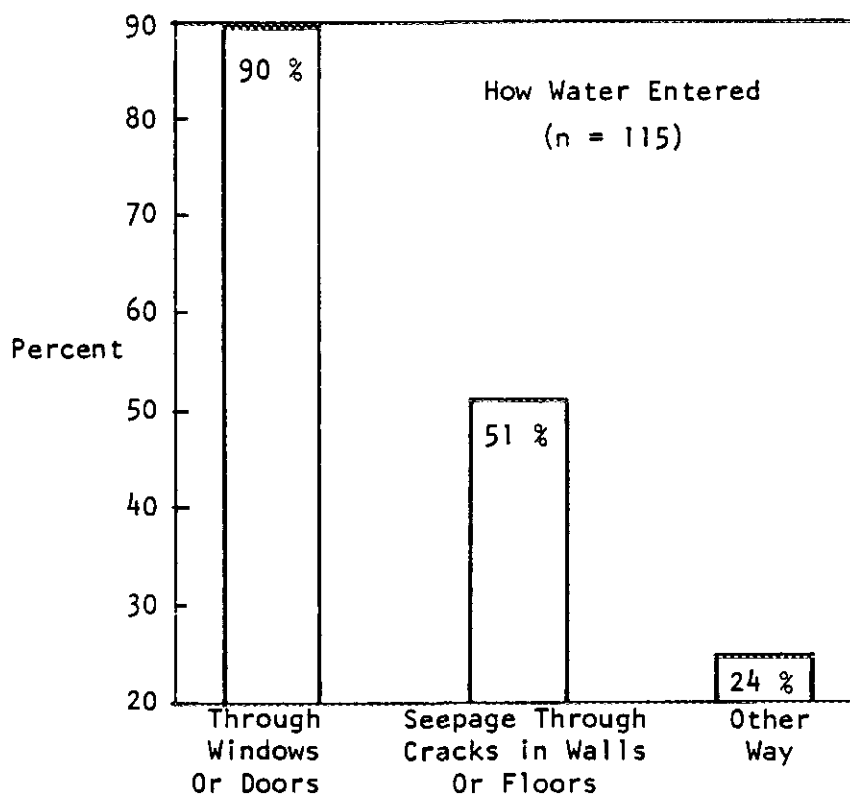
Of those respondents who reported flooding damage, 97 percent listed flood damage to the interior contents of their homes, and more than four-fifths (83 percent) also had their interior walls damaged by flooding. Write-in answers to the question of what was damaged included cars, plumbing, driveways, lawn mowers, bicycles and outdoor furniture and tools.



Note: Percentages do not sum to 100, since multiple responses were allowed.

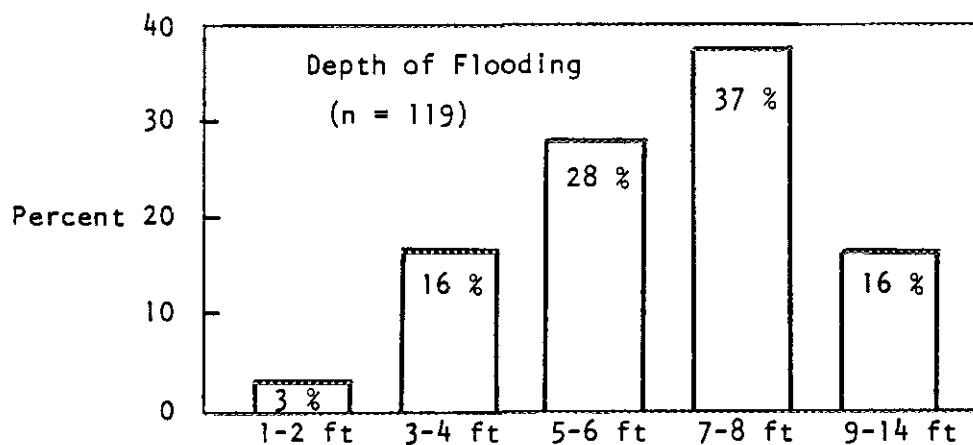
Flood Water in the Home (122 responses)

Of the 122 respondents reporting on their flooding experiences, only one indicated that water did not enter the residence. Of the 115 who indicated how the flood water entered their homes, 90 percent answered through windows or doors, while more than half (51 percent) answered that the waters had also come in through seepage through cracks in walls or floors. Other areas where water entered included through crawl space, through sewerage, through sump pump holes, and through bathtubs and toilets. Comments of some of the respondents indicate the overwhelming nature of the Blizzard of '78: "When water came up to the level of the first floor it just poured in evenly in all rooms." Water was described as coming in "any place possible" and "knocking down walls."

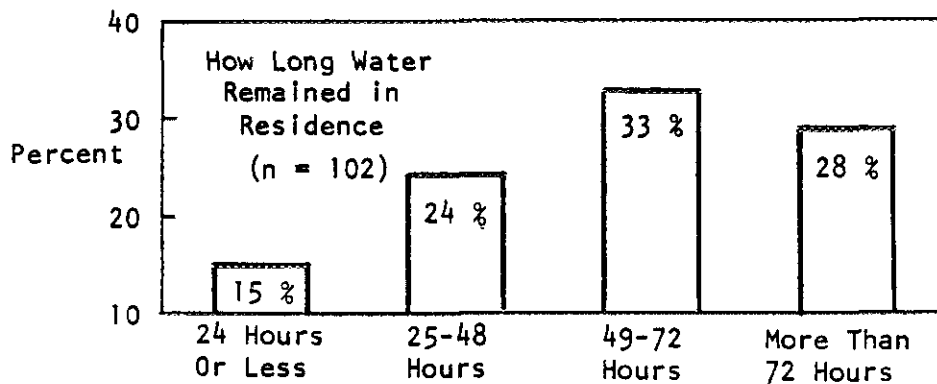


Note: Percentages do not sum to 100, since multiple responses were allowed.

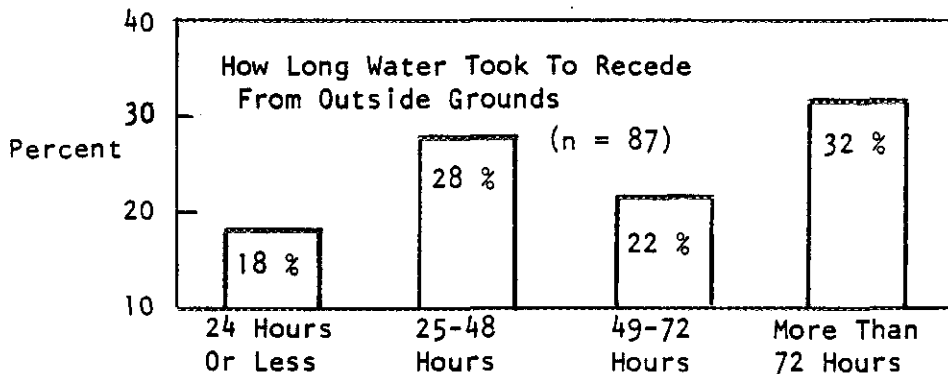
Only three percent of those who have been flooded measured less than two feet of water in their homes during the worst flooding they had experienced. The largest group (37 percent) measured seven to eight feet of water in their residence.



Once the flood waters had entered their home, one-third of the respondents (33 percent) reported that it remained there for 49 to 72 hours, and nearly one-third (28 percent) indicated that they had water in their homes for more than 72 hours.

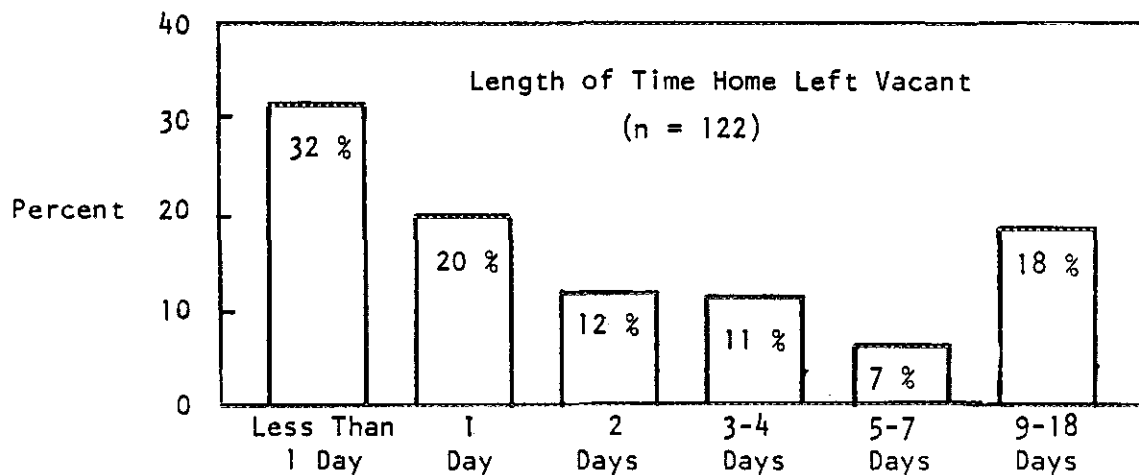


Because the flood water deposited by the Blizzard of '78 froze into sheets of ice, many respondents suggested that it was "hard to say" how long it took for the flood waters to recede from the ground outside the home. About one-third (32 percent) of the 87 persons who answered this question estimated that it took more than 72 hours for the water to recede.



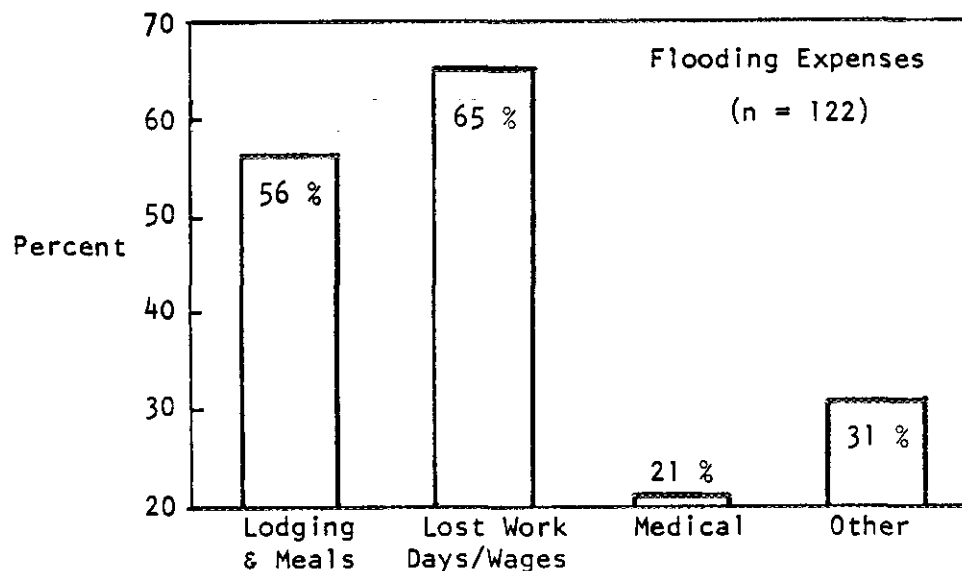
Impacts of Flooding (122 responses)

Of the 122 flooded respondents, 109 (89 percent) were forced to vacate their residences, as follows.



Expenses Involved (122 responses)

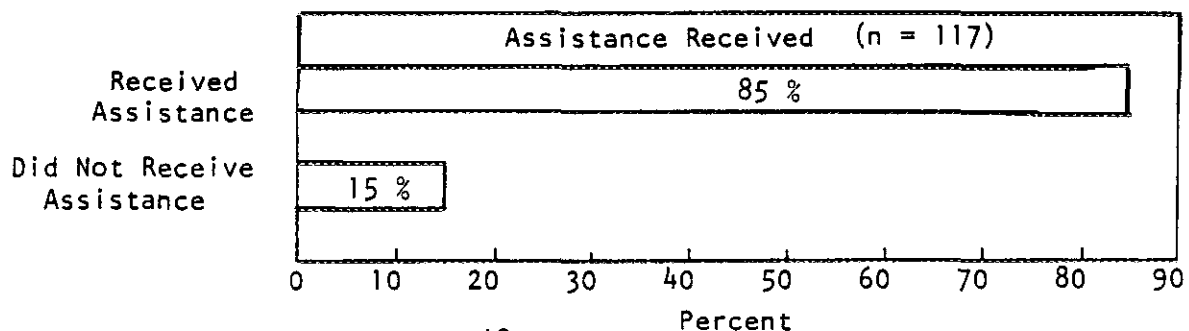
More than half of those experiencing severe flooding were forced to spend money for meals and lodging (56 percent) and lost wages because of having to miss work (65 percent). Some of the most severe medical costs attributed to the Blizzard of '78 included surgery for a heart attack and a miscarriage. Other expenses written in by respondents included depreciated values on their residences, transportation costs, obligations to relatives who sheltered them and replacing automobiles. Replacement of flood-damaged items within the homes was, of course, a major expense.



Assistance Received (117 responses)

More than four-fifths (85 percent) of the 117 respondents whose homes or property had been damaged by floods received some sort of government or private assistance. One respondent wrote that he "would have died without it." Several respondents expressed bitterness that their age had precluded them from certain types of loans and aid. Agencies and programs assisting flood victims included:

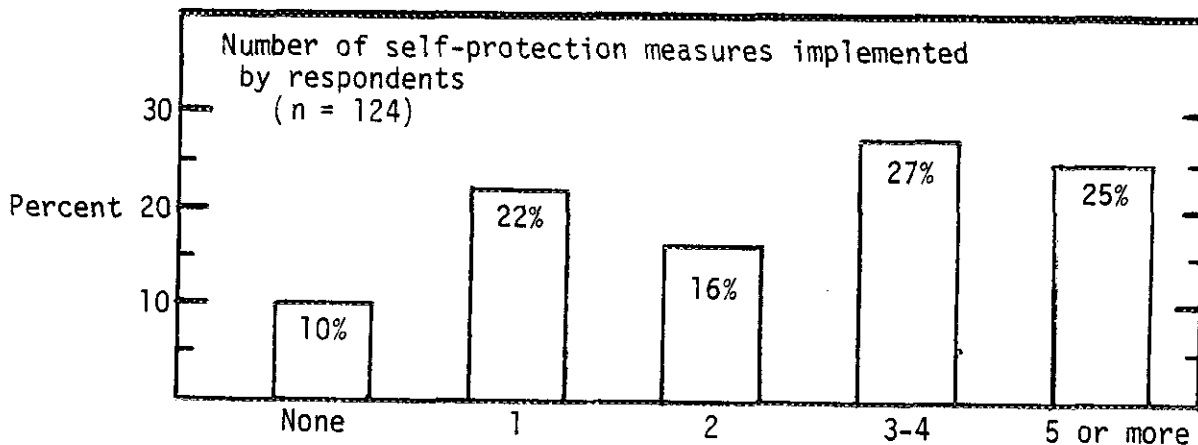
- Small Business Administration (SBA) loans
- HUD grants
- Red Cross (clothing and shelter)
- Food stamps
- Welfare
- Insurance (discussed later in this report).



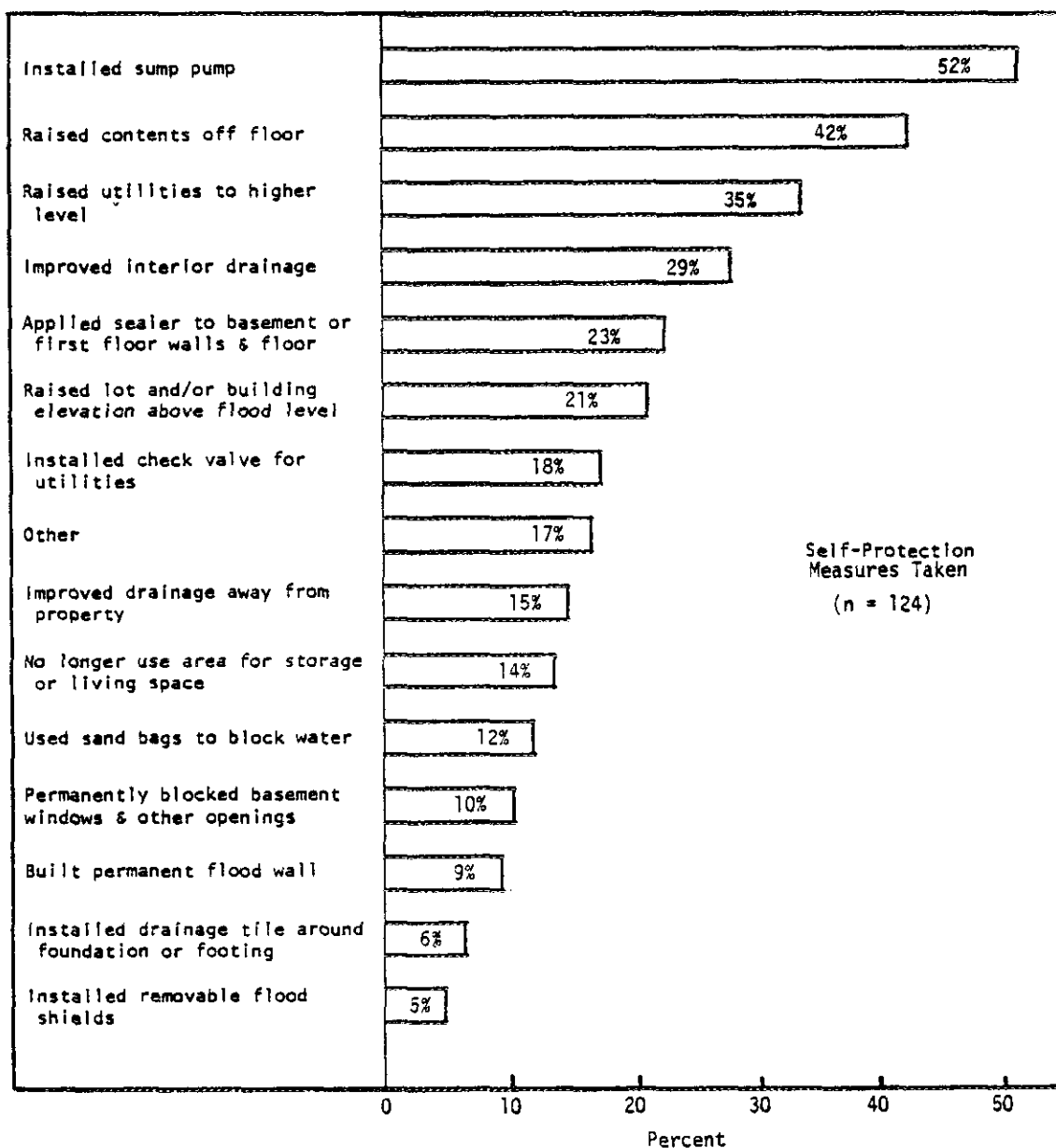
2.4 Self-Protection Measures

The preceding discussions have focused on Revere residents' experience with flooding, as reported in Section A of the Flood Protection Questionnaire. This section will analyze responses to Part B of the Questionnaire--self-protection measures these residents have taken to reduce the possibility of flood damage.

The questionnaire offered 15 possible choices covering a wide range of possible self-protection measures, and asked respondents to check all that they had implemented. Of a total of 137 respondents, only 124 answered this particular questionnaire item. Exactly nine-tenths (90 percent) of these 124 respondents indicated that they had implemented at least one of the 15 self-protection measures listed, while 10 percent reported that they had not taken any of the measures outlined in the questionnaire to reduce flood damage. Furthermore, more than half (52 percent) report that they have implemented three or more measures, compared to 22 percent adopting only one measure and 16 percent adopting two.



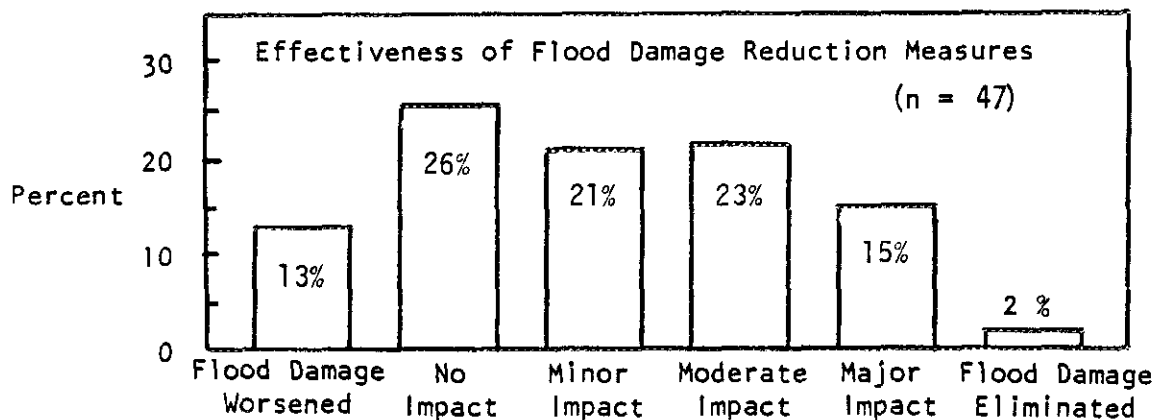
The figure below lists the choices rank-ordered by preference. Roughly one-half of the 124 respondents (52 percent) had installed a sump pump, although several write-in comments questioned the efficacy of such a measure, since electricity is one of the first things to be lost during a flood. Two other easily-implemented self-protection measures were implemented by more than one-third of the respondents: 42 percent had raised contents off the floor, and 35 percent had raised their utilities to a higher level. Almost 21 percent had the financial resources available to raise their building. Six respondents (5 percent) reported that they were unaware of the flood problem.



Effectiveness of Self-Protection Measures (47 valid responses)

Of the 127 respondents who evaluated the effectiveness of the various protection measures taken, 38 reported information which was inconsistent with other information elicited by the questionnaire. For example, 30 of the respondents who indicated for this question that no self-protection measures had been taken actually listed for an earlier question at least one specific measure which they had adopted. Furthermore, 8 respondents who evaluated the effectiveness of self-protection measures taken indicated in an earlier question that no measures had been adopted. Hence, the evaluations of 38 respondents were discarded due to inconsistencies. Also, the question did not apply to an additional 42 respondents (25 of whom indicated that they had experienced no subsequent flooding after taking self-protection measures, and 17 of whom had taken no self-protection measures) who were therefore not able to comment on the measures' effectiveness.

Of a total of 127 responses then, 38 were discarded for inconsistencies and 42 for being inappropriate, leaving a total of 47 credible and appropriate evaluations. Of these, almost two-thirds (61 percent) reported that the measures resulted in a lessening of their flood damage, while 39 percent reported that the measures resulted in no improvement, at best, or in a worsening of their flood damage, at worst. A very small number of respondents (two percent) answered that the measures they had taken resulted in the elimination of subsequent flood damage to their residence. The figure below indicates how effective the 47 respondents consider the measures they have taken to be.

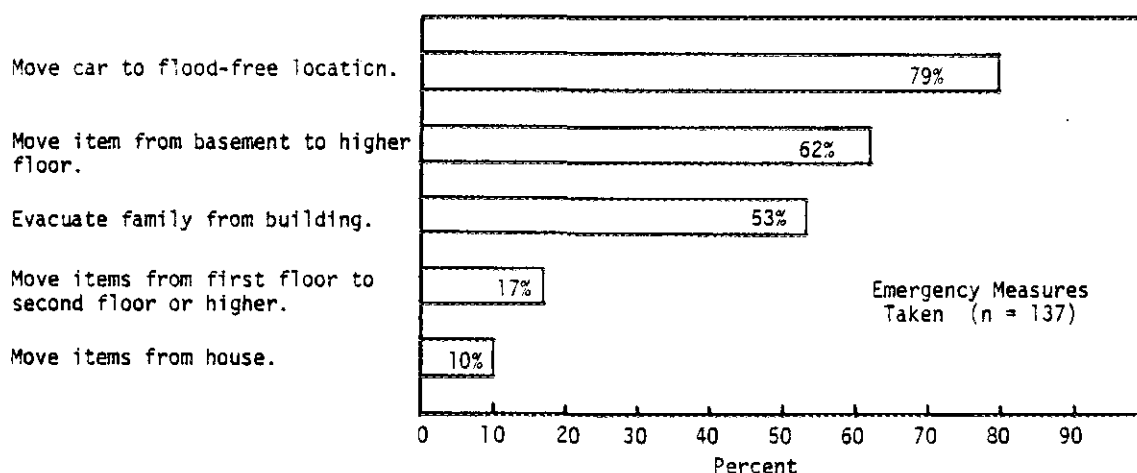


Emergency Measures (137 responses)

Generally, the five emergency measures suggested by the survey appeared to cover almost all measures taken by residents when storm conditions appear imminent. Write-in answers added the following additional measures: brace first floor doors,

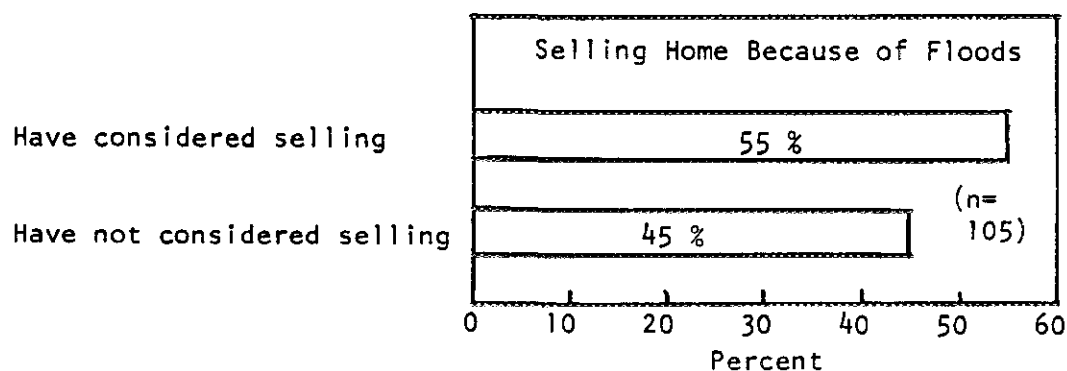
remove items from garage, remove gas valves from furnace and water heater, turn off water and drain pipes, shut off circuit breakers to prevent fire, and "disconnect oil burner, install additional pumps, pray a lot!"

The measure taken by the largest number of respondents (79 percent) was to move their car(s) to a flood-free location; the second most frequent measure (done by 62 percent of the respondents) was to move items from the basement to a higher floor.



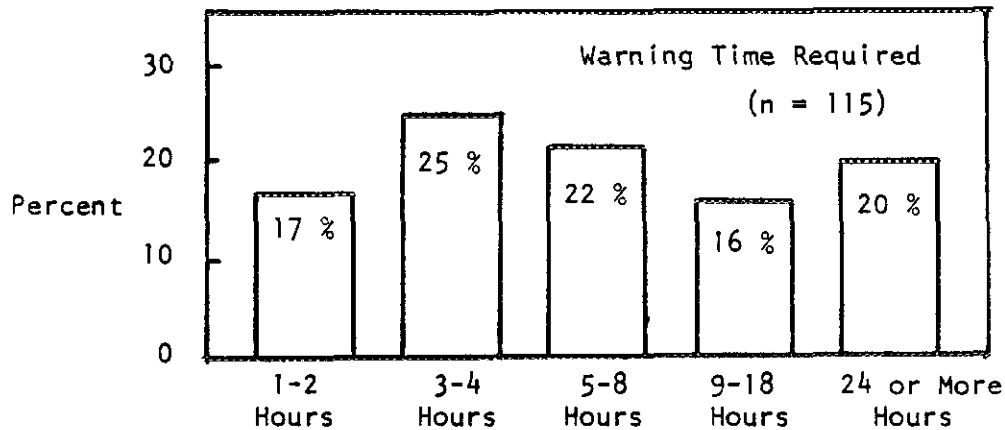
Consider Sale of Home (105 responses)

Of the 105 homeowners responding to the survey question, "Have you ever considered selling your residence because of flooding problems?", 55 percent answered "yes", 45 percent said "no." These percentages did not change appreciably when those respondents residing near to and those living farther away from the shore were considered separately.



Warning Time Required (115 responses)

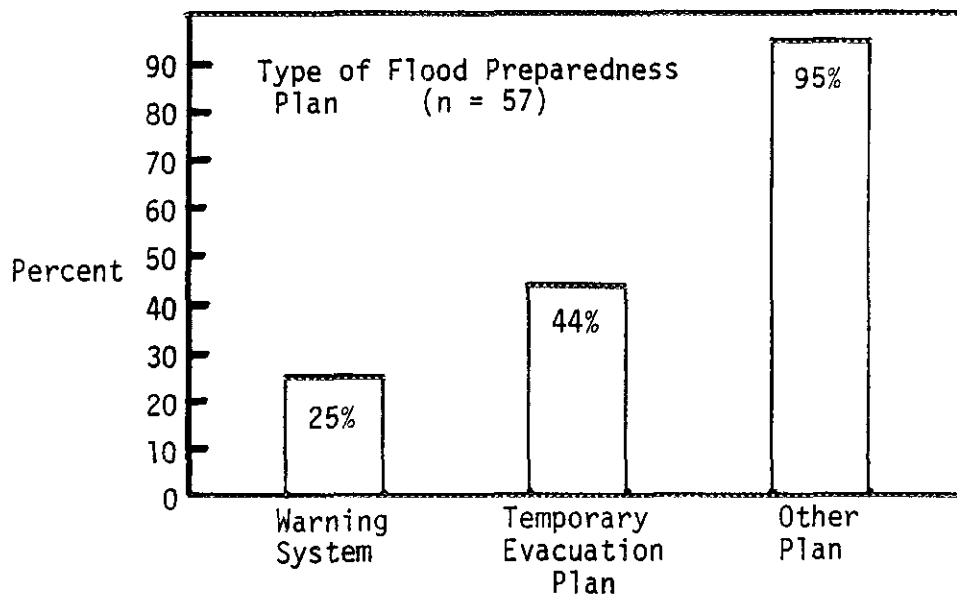
Responses to the number of hours required to take emergency measures to protect property were uniformly distributed over a wide range of hours. The minimum number of hours needed was written in as "one" and the maximum number of hours needed was 103. The range of hours and the percentage of respondents within each range is illustrated below.



Type of Flood Preparedness Plan (137 responses)

Nearly six-tenths (58 percent) of the 137 persons who answered the question of whether they lived within an area covered by some type of flood preparedness plan said they were "unaware of any plan." Of the 57 respondents who were aware of a flood preparedness plan, 25 percent reported that the area in which they lived had a warning system, and 44 percent cited a temporary evacuation plan as being part of the flood preparedness plan of which they were aware. Almost all of the 57 respondents in question (95 percent) indicated that they received warning or notification in other ways as well. Some of these included:

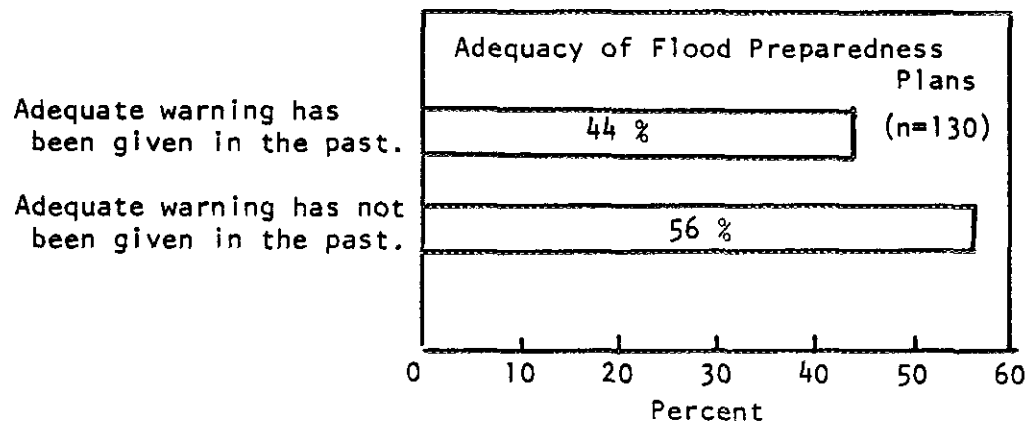
- Public Works Department calls for evacuation
- Own observations
- Next door neighbor
- Civil Defense
- "The mayor should be awarded a medal for his quick actions."
- TV weather reports
- Warnings from firemen
- Police warnings
- Radio



(Note: Percents do not sum to 100, since multiple responses were allowed.)

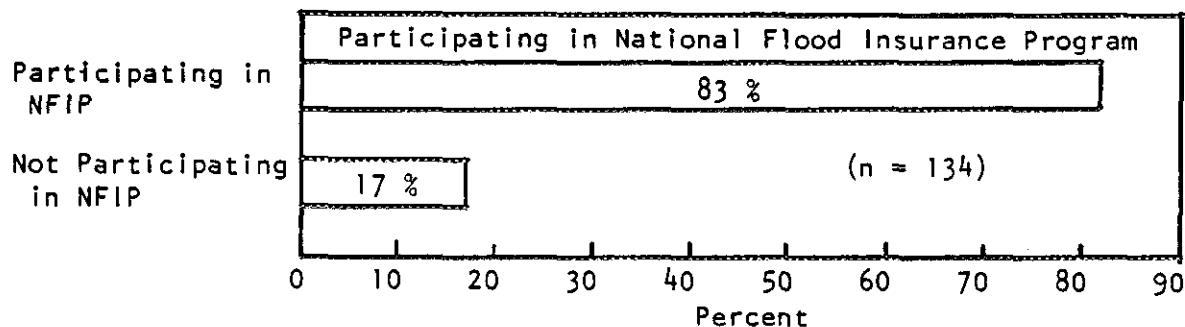
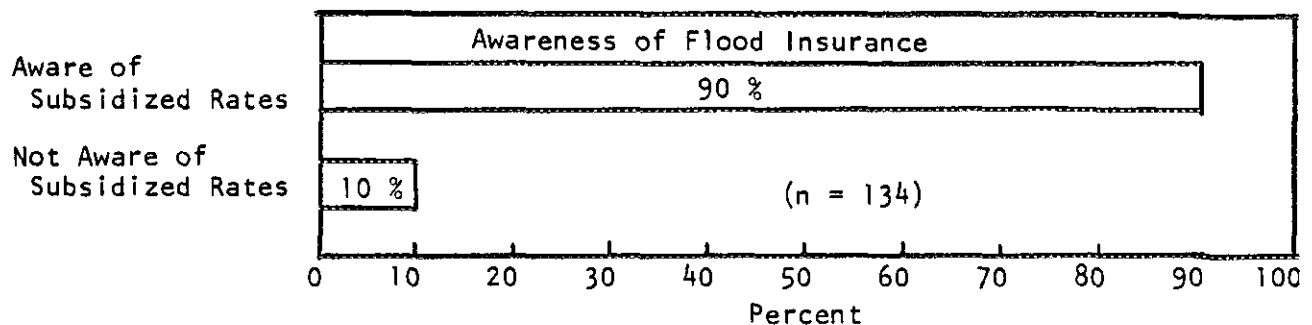
Adequacy of Flood Preparedness Plan (130 responses)

More than half the responses (56 percent) felt that adequate warning had not been given in the past before flood events.



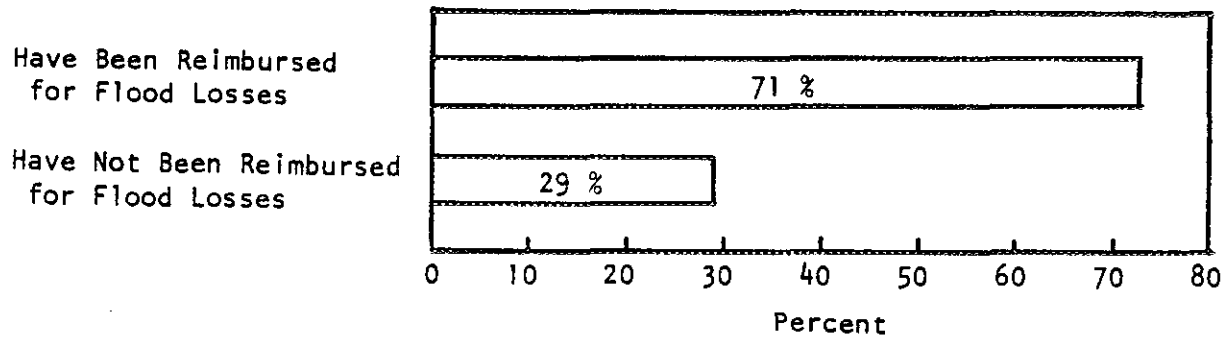
Flood Insurance (134 responses)

Ninety percent of the 134 persons who answered this survey question indicated they were aware that flood insurance is available through insurance agents at rates subsidized by the Federal government. More than four-fifths of the 134 respondents are currently participating in the National Flood Insurance Program.



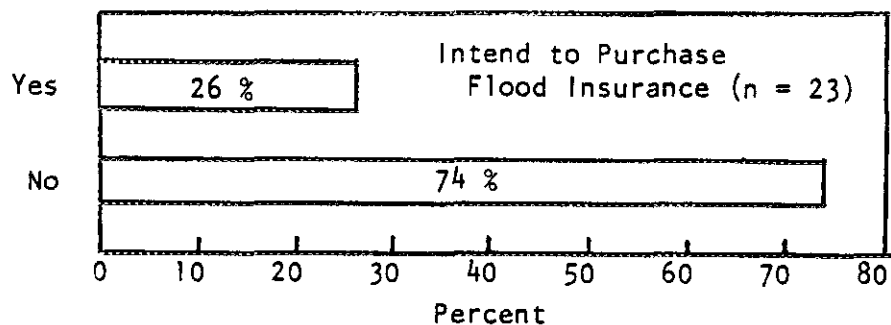
Reimbursement for Flood Losses (111 responses)

Of the 111 respondents currently participating in the National Flood Insurance Program, 79 (71 percent) indicated they have received reimbursement for past flood losses. Some of the comments that accompanied this response suggested the insurance was inadequate, that the policy was "filled with ambiguity," that the policy rates were raised every year, and that those who rent their residences are not eligible for this insurance.



Intent to Purchase Flood Insurance (23 responses)

Of the 23 respondents who do not currently participate in the National Flood Insurance Program, only six (26 percent) indicated that they intended to purchase this insurance.



2.5 Preferences for Flood Damage Measures

Questionnaire respondents rated the 15 flood damage reduction measures as shown in the following figure (p. 22). Of the 101 respondents answering question C16 (Section C), 79 percent expressed opposition to the statement that none of the 15 flood damage reduction measures should be implemented, while 9 percent agreed with the statement. The remaining 12 percent were neutral.

Structural Flood Damage Reduction Measures

Four of the 15 measures were favored by more than 90 percent of the respondents. These were:

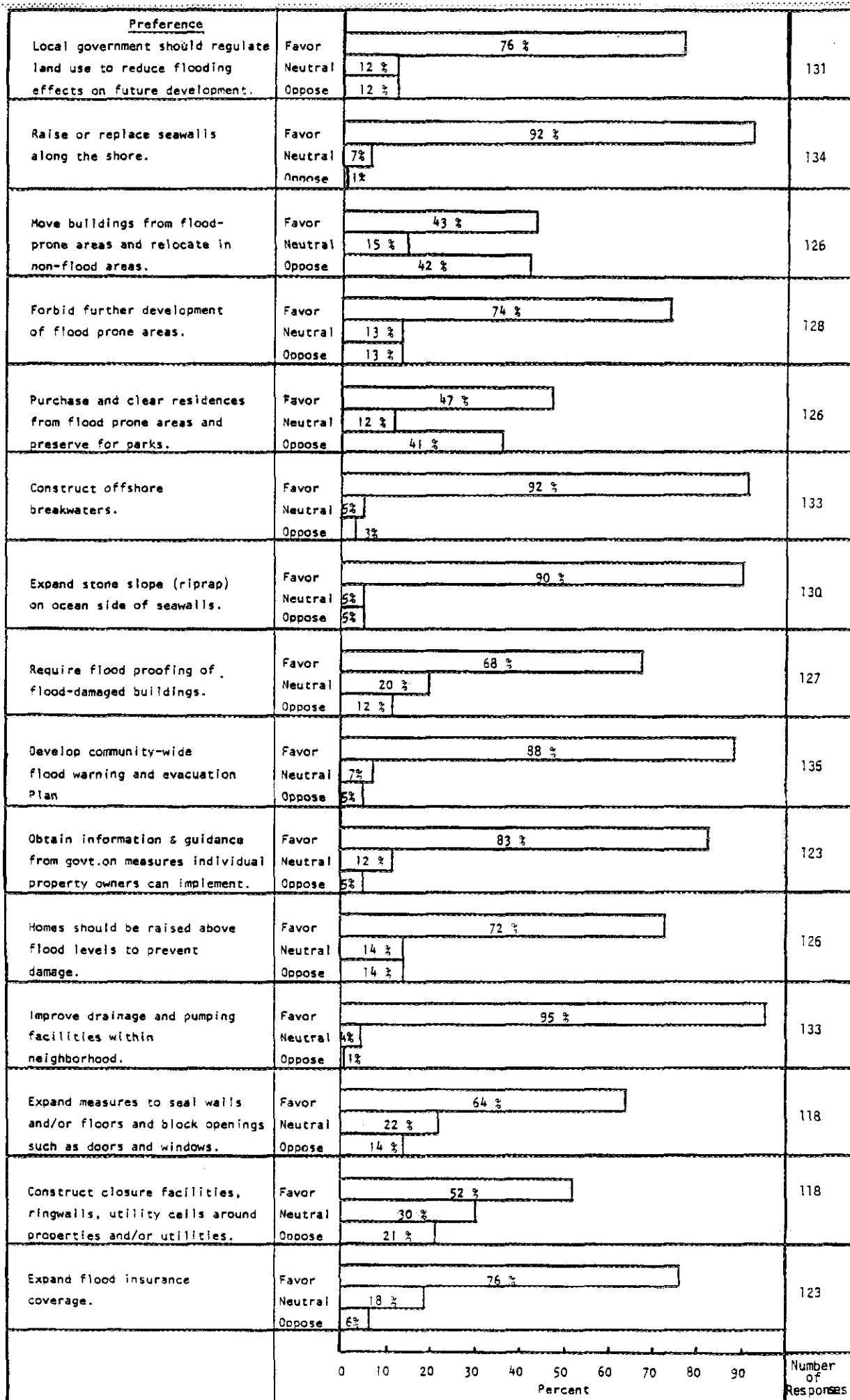
- Improve drainage and pumping facilities within neighborhoods. 95 percent
- Raise or replace seawalls along the shore. 92 percent
- Construct offshore breakwaters 92 percent
- Expand stone slope on the ocean side of seawalls. 90 percent

These "preferred" alternatives are all structural in character as defined in the Information Brochure (Appendix C).

Looking only at those respondents expressing an opinion and excluding "neutral" responses (i.e., the ratio of those favoring versus those opposed), these four measures can be ranked as follows:

Structural Measures	Number in Favor	Number Opposed	Ratio *
● Improve drainage and pumping facilities	126	2	63:1
● Raise or replace seawall along shore	123	2	62:1
● Construct offshore breakwaters	122	4	30:1
● Expand stone slope (riprap on ocean side of seawalls)	117	7	17:1
● Average for all 4 measures	122	4* (3.75)	32:1

* Numbers are rounded to nearest integer value.



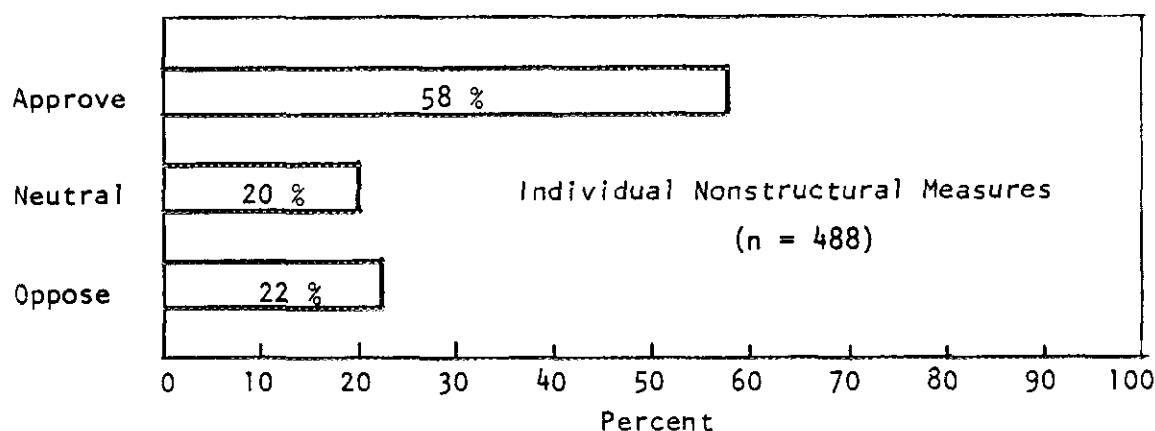
Considered collectively, the opinion ratio for this category is 32 to 1 in favor of the measures. The number of respondents who neither favor nor oppose these measures ("neutral") is quite low, ranging from 4 to 7 percent of the total.

Nonstructural Flood Damage Reduction Measures

The remaining flood damage reduction measures are included in the nonstructural category. These are measures applied to individual properties or to the land in or around a community.

Individual Flood Damage Reduction Measures (488 responses)

On an overall basis, flood protection and damage reduction measures applied to individual properties were approved by more than half of the respondents (58 percent). One survey respondent included a typed list of ten suggestions for reducing flooding while another included a professional plan for flood-proofing the house but felt the chances for it being effective were slim, since the house was level with the street in front and low in the back. The same respondent added another measure: "Pray for no more floods!"



The ranking of these individual measures according to the ratio of respondents favoring to those opposing is summarized in the following table. These ratios are considerably lower than obtained for any of the structural measures. The polarity for the "move buildings" alternative indicates potential conflict. No statistically significant association was found between location and preference for the "move buildings" alternative. However, preference ratings for the "move buildings" alternative differed

significantly when homeowners who reported that they have considered selling their homes were compared to homeowners with no intention of selling. Briefly, potential "sellers" avored the "move buildings" alternative by a 3-to-1 margin over non-sellers. Conversely, three times as many non-sellers as sellers expressed opposition to this alternative.

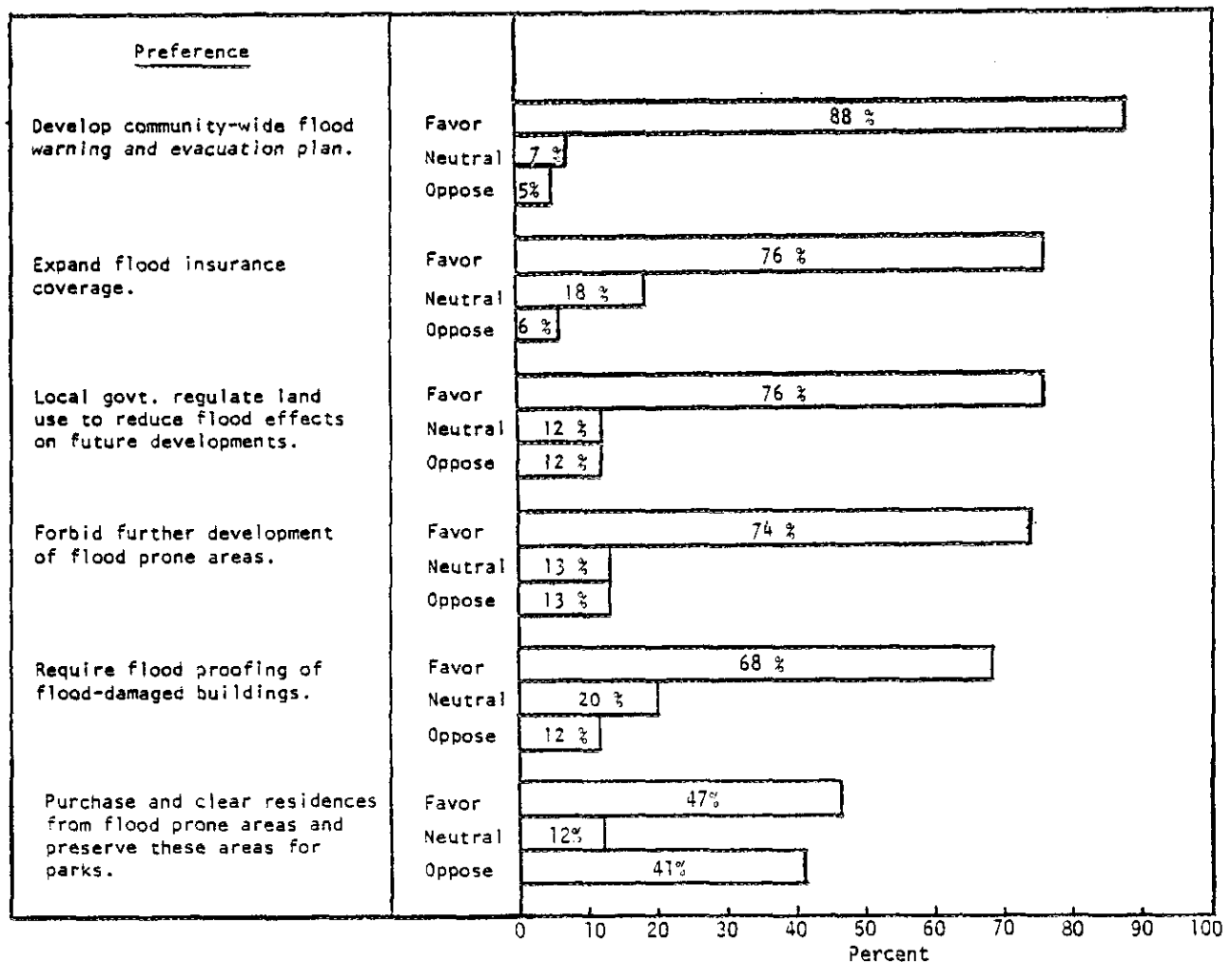
Individual-Oriented Nonstructural Measures	Number in Favor	Number Opposed	Ratio*
● Raise houses above flood levels to prevent damage.	90	18	5:1
● Expand measures to seal wells and/or floors and block openings such as doors and windows.	75	17	4:1
● Construct closure facilities ringwalls, utility cells around properties and/or utilities.	62	21	3:1
● Move buildings from flood-prone areas and relocate in non-flood areas.	54	53	1:1
● Average for all 4 measures.	70*	27*	3:1

* Numbers are rounded to nearest integer values.

Neutral responses to these items ranged from 14 to 30 percent of the total.

Community-Oriented Nonstructural Measures (770 responses)

Preferences for the six community-oriented nonstructural measures presented in the survey are illustrated below, ranked by order of preference. The measure rated highest (88 percent in favor) was developing a community-wide flood warning and evacuation plan. Purchase and clearance of residences from flood prone areas and preservation of these areas for parks was the lowest ranked (47 percent in favor).

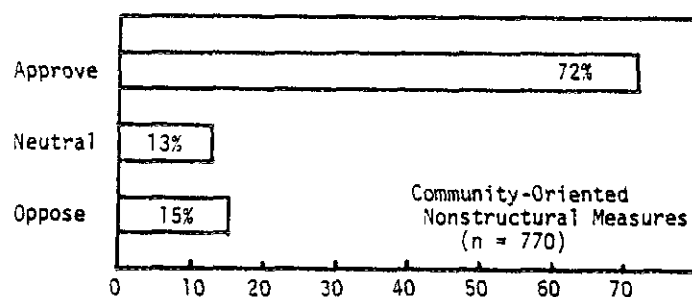


When considering the ratio of respondents favoring to those opposing the above measures (excluding "neutral" responses), the ranking remains the same. The alternative for purchase and clearance of residences has nearly equal numbers in favor and opposed indicating that this is a controversial measure. Public purchase of buildings was preferred slightly more than if accomplished by an individual (discussed on page 23). As with the moving of buildings by individuals, there was no statistically significant association between location and preference for the building clearance alternative. However, homeowners who reported that they have considered selling their homes favored the public purchase and relocation of residences in flood-prone areas by a statistically significant 3-to-1 margin over those homeowners with no intention of selling.

Considered collectively, these community-oriented nonstructural measures are approved by 72 percent and have an average approve-oppose ratio of 5 to 1 in favor of the measures.

Community-Oriented Nonstructural Measures	Number in Favor	Number Opposed	Ratio *
• Develop community-wide flood warning and evacuation plan.	118	7	17:1
• Expand flood insurance coverage.	93	8	12:1
• Local government regulate land use to reduce flood effects on future developments.	100	16	6:1
• Forbid further development of flood-prone areas.	95	17	6:1
• Require flood proofing of flood damaged buildings.	86	16	5:1
• Purchase and clear residences from flood-prone areas and preserve these areas for parks.	59	52	1:1
• Average for all 6 measures.	92*	19*	5:1

*Numbers are rounded to nearest integer values.



3.0 ASSESSMENT

The preceding description of questionnaire analysis results (Section 2) presented straightforward tabulations of survey responses. The purpose of this section is to present a review of these results with the following objectives in mind:

- To assess validity or representativeness of responses in terms of known characteristics of the survey area.
- To interpret survey results according to the planning context within which results could be used.

This assessment generally follows the structure of the preceding section.

3.1 Respondent Characteristics

Based on information from the first seven survey questions, a "profile" of questionnaire respondent characteristics can be developed as follows:

- 80 percent of respondents own their residence (20 percent rent).
- The average length of residence is 17 years.
- 99 percent of respondents are year-round residents.
- The average age of residential buildings is 50 years.
- 82 percent of residents have full basements.
- 63 percent of residences are single family (37 percent multi-family).

These data suggest that the Roughan's Point neighborhood is a stable community of long-term residents and are consistent with community profile data obtained from the City of Revere (Kominski, 1981). Most of the land in Revere above 10 feet MSL is fully developed and, for all practical purposes, any new development could be expected only at the expense of existing uses (COE, 1980). A comparison of the preceding "profile" with census data from an area considerably larger than (but including) the survey population area, however, suggests that homeowners (vs. tenants), long-term residents, residents inhabiting newer structures (11-30 years old) and single family residences are over-represented in the survey sample, along with individuals residing near the shore.

The potential bias of results due to a higher percentage response from residents living close to the shore is not considered to be meaningful. As will be shown below, the great majority of Roughan's Point residents were flooded during the February 1978 event, so all can logically be considered as one group. Any additional potential bias (not addressed further herein) can more likely be attributed to initial selection of the survey population. That is, only residents of the low-lying Roughan's Point neighbor-

hood were selected. Hence, survey results do not necessarily represent Roughan's Point as a whole.

3.2 Flooding Experiences of Residents

One can easily conclude from the survey results that residents of the Roughan's Point neighborhood have suffered extensive damages and hardships due to flooding. A profile of flooding experiences includes the following:

- Almost 90 percent of respondents have been flooded at least once -- 70 percent more than once.
- The Blizzard of '78 was the worst experience for 85 percent of those flooded.
- Of those flooded, 96 percent incurred damages. Most damages were incurred in basements but more than 50 percent incurred damages to first floor living areas and contents.
- 90 percent of those flooded reported that water entered through doors and windows.
- More than 80 percent of those flooded estimated water depths within their homes to be 5 feet or deeper.
- Almost 70 percent of those flooded were forced to vacate their residence for 1 day or more, 48 percent vacated 2 days or more and 18 percent 9 days or more.
- The Blizzard of '78 was particularly aggravating because water froze into sheets of ice which extended the time for flood waters to recede.
- Almost two-thirds of those flooded incurred costs due to lost work days/wages. The majority had to pay for other lodging and meals. One-fifth incurred medical expenses.
- 85 percent of those flooded received some sort of government or private assistance.

The above profile is consistent with other reports on the February 1978 blizzard and flood (Boston Globe, 19 February 1978). In that article, mention is made in general terms of the extent of damages and personal losses. The Federal Disaster Relief Center in the basement of St. Anthony's Church provided assistance and coordination for hundreds of Revere residents in search of low-cost loans, clothing, food and living quarters. A dozen or more of the roughly 250 homes in the neighborhood were reported knocked from their foundations.

3.3 Self-Protection Measures

Results of the survey indicate substantial use of self-protection measures to reduce flood damages by Roughan's Point residents. This use of self-protection measures reflects individual residents' commitment to avoid future flooding damages,

as well as availability of public funds to residents for assistance, recovery and rebuilding. The following profile summarizes the responses:

- Ninety percent of the respondents have implemented one or more self-protection measures.
- A substantial number of residents have implemented some of the more costly floodproofing measures including raising of utilities (35%) and entire buildings (21%).
- A majority of residents who implemented self-protection measures claim at least a minor lessening of subsequent flood impact damages.
- Residents have a limited capability to quickly respond to flood threat. Emergency measures most commonly used consisted of moving car and family away from the area and moving some items from basement to higher floor.
- More than one-half of residents have considered selling their home because of the flood problem.
- Over 80 percent of respondents require more than 2 hours warning time.
- Almost 60 percent of respondents were unaware of any flood preparedness plan and 56 percent felt that adequate warning had not been given in the past.
- 83 percent of respondents are currently participating in the National Flood Insurance Program and, of these, 71 percent received some reimbursement for flood losses.

The profile of self-protection measures is consistent with other information available for the area. Floodproofing of buildings was promoted after the February Blizzard of '78 under the aegis of the *Massachusetts Coastal Floodproofing Program*. This program provided grants and technical advice to low and moderate income homeowners living on the coastal flood plain (MCFP, Undated). It is estimated that \$500,000 will have been spent on floodproofing of coastal properties in Revere by 1982 (Kominski, 1981).

Also, it is estimated that approximately 35 homes in Roughan's Point have been or are in the process of being raised. This would be about 10 percent of the total number of structures, and is likely to be 15 to 18 percent of the single family homes in the Point itself (D. Platt, personal communication, May 1981). Twenty-one of these buildings are located on Broad Sound Avenue. These building raisings are assumed to be in part funded by the above-cited floodproofing program.

The high percentage of respondents participating in the National Flood Insurance Program can be related to the Floodproofing Program, as well as to previous programs for coastal flood plain management in Massachusetts. The floodproofing program requires purchase of Federal Flood Insurance, as do other municipal programs

motivated by Federal policy and funding initiatives. The high NFIP participation and reimbursement percentages also indicate that most residents were aware of flood threat prior to the Blizzard of '78. Dissatisfaction of the NFIP was expressed for select aspects of coverage, primarily exclusion of renters from coverage and coverage reimbursement limitations.

Finally, there seems to be considerable dissatisfaction and/or confusion regarding the existence and adequacy of flood emergency preparedness plans. The City of Revere currently has an emergency preparedness plan in place consisting of an Emergency Operating Center and associated communication networks and lines of command (Bob Krinsky, City of Revere, personal communication, May 1981). During the Blizzard of '78, the Revere Fire Department worked closely with Metropolitan District Commission crews to assist residents threatened by flooding. The U.S. Army Reserves were called on to assist with evacuation of residents when forecasts indicated that severe flooding was imminent.

3.4 Preferences for Flood Damage Reduction Measures

Results of the survey on preferences for flood damage reduction measures seem to clearly identify measures preferred by Roughan's Point residents. The following profile summarizes these preferences.

- More than 90 percent prefer each of the structural measures.
- With the exception of the "purchase and clearance of buildings" alternative, more than two-thirds of respondents favor each community-oriented nonstructural alternative.
- A majority of respondents prefer individual nonstructural flood damage reduction measures.
- Only 10 percent think nothing should be done.

Several aspects of these results on preferences are of interest. First, although the structural measures can be ranked using a favor/oppose opinion ratio, such ranking may not be meaningful given the small numbers of respondents expressing opposition. Further communication with Roughan's Point residents on details of the various structural measures is the focus of on-going Corps of Engineers planning activities.

The community-oriented flood damage reduction measures were generally favored by respondents, particularly the development of a flood-warning and evacuation plan. Although such a plan is apparently in-place, it may be productive to communicate details of the plan to residents.

The high percentage of respondents (75%) in favor of expanding flood insurance coverage is interesting because so many people were covered prior to the '78 flood and received some reimbursement. This result can be interpreted as dissatisfaction with

the level of coverage. However, given the frequency of flooding in Roughan's Point, complete coverage without controls might be considered to be an inducement for continued losses. Indeed, an equal percentage of respondents seem to have accepted the need to regulate land use and future development through local governmental action.

Nonstructural flood damage reduction measures applicable to individual properties are also favored and have already been implemented by a majority of respondents. Public and individual funds for implementation of various floodproofing measures are being put to use and there is an apparent demand for more.

Purchase and clearance of flood damaged buildings as a possible alternative damage reduction strategy has been investigated by the Federal Emergency Management Agency (FEMA). Representatives of FEMA communicated with City of Revere officials and conducted field investigations to determine if enough eligible properties existed in Roughan's Point to warrant a purchase and clearance program. FEMA concluded that not enough eligible properties existed--in part due to rapid repair of damaged properties (FEMA, 1981).

4.0 CONCLUSIONS

Results of the Roughan's Point Social Survey support the following generalized conclusions:

- The Roughan's Point neighborhood suffers intermittent flood damages and was severely hit by the Blizzard of February 1978.
- Use of self-protection measures by Roughan's Point residents is substantial--in part due to availability of public funds after the Blizzard of '78.
- Residents of Roughan's Point prefer structural flood damage reduction measures above all else.
- There is overall acceptance of the need for a unified program of continued implementation of self-protection measures and local governmental land use management and regulation of floodplain lands.

Recommendations derived from review of survey results are posited as follows:

- The Corps of Engineers should proceed with communication activities directed toward residents of Roughan's Point to explain details of structural and nonstructural flood damage reduction alternatives.
- The Corps of Engineers should continue to integrate their planning activities with other Federal, State and City of Revere floodplain management and planning programs.
- An educational program for flood emergency preparedness planning should be considered to help alleviate apparent confusion about the current program.

5.0 REFERENCES

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Corps of Engineers, 1980, Reconnaissance Report--Coastal Flood Protection, Revere, Massachusetts, New England Division, Waltham, MA, February.

Federal Emergency Management Agency (FEMA), 1981, personal communication with Mr. Rob Sonnichsen, May.

Kominski, Steven, 1981, personal communication, Office of Planning and Community Development, City of Revere, MA, May.

Krinski, Robert, 1981, personal communication, City of Revere, May.

Massachusetts Coastal Floodproofing Program (MCFP), indicated brochures, Protect Your Home Against Flooding, Boston, MA.

Platt, Diana, 1981, personal communication, Corps of Engineers, New England Division, May.

APPENDIX A
QUESTIONNAIRE

ROUGHAN'S POINT FLOOD PROTECTION QUESTIONNAIRE

Your answers to this questionnaire will help us learn about your experiences with flooding and what you feel are the most preferable flood damage reduction measures. It is important that you provide complete answers to all questions. If you have additional comments, or if some questions do not seem to apply to your particular situation, feel free to write in comments.

Please return the completed questionnaire (keep the informational pages) in the enclosed stamped, addressed envelope. And thank you for your help.

Section A. Your Experience with Flooding

In this section we would like to learn some general information about the building you live in and the extent to which you have been affected by flooding.

<p>A1. What is your Roughan's Point street address? (street) _____</p> <p>A2. Do you own or rent your residence at this address? <input type="checkbox"/> Own <input type="checkbox"/> Rent For how many years? _____</p> <p>A3. How do you use the residence? <input type="checkbox"/> Year-Round <input type="checkbox"/> Seasonal: From _____ To _____</p> <p>A4. Approximately how old is your residence? _____ years old</p> <p>A5. Do you have a: Check all that apply. <input type="checkbox"/> Full Basement <input type="checkbox"/> Slab <input type="checkbox"/> Crawl Space <input type="checkbox"/> Garage <input type="checkbox"/> Basement Under Part of the House</p> <p>A6. If you have a basement, how do you use it? (For example: storage, recreation room etc.) _____</p>	<p>A7. What type of structure are you living in?</p> <table border="0"><thead><tr><th><u>Single Family:</u></th><th><u>Multifamily:</u></th></tr></thead><tbody><tr><td><input type="checkbox"/> Single Story</td><td><input type="checkbox"/> Duplex</td></tr><tr><td><input type="checkbox"/> Split Level</td><td><input type="checkbox"/> First Floor</td></tr><tr><td><input type="checkbox"/> Two Story or more</td><td><input type="checkbox"/> Second Floor or Above</td></tr><tr><td><input type="checkbox"/> Mobile Home</td><td><input type="checkbox"/> Other _____</td></tr></tbody></table> <p>If multifamily, how many units in building? _____</p> <p>A8. To date, have either your property or residence ever been flooded? <input type="checkbox"/> No → (Go directly to Question B1.) <input type="checkbox"/> Yes ↳ How many times? _____ If more than once, what is the month and year of the most severe flooding experience? Month _____ Year _____</p>	<u>Single Family:</u>	<u>Multifamily:</u>	<input type="checkbox"/> Single Story	<input type="checkbox"/> Duplex	<input type="checkbox"/> Split Level	<input type="checkbox"/> First Floor	<input type="checkbox"/> Two Story or more	<input type="checkbox"/> Second Floor or Above	<input type="checkbox"/> Mobile Home	<input type="checkbox"/> Other _____
<u>Single Family:</u>	<u>Multifamily:</u>										
<input type="checkbox"/> Single Story	<input type="checkbox"/> Duplex										
<input type="checkbox"/> Split Level	<input type="checkbox"/> First Floor										
<input type="checkbox"/> Two Story or more	<input type="checkbox"/> Second Floor or Above										
<input type="checkbox"/> Mobile Home	<input type="checkbox"/> Other _____										

Questions A9. through A16. deal with the worst flooding experienced on your property or at your residence.

A9. Approximately how deep was this flooding?
(If not sure, please give best estimate.)

_____ feet

A10. Where was this depth measured (basement, first floor, etc.)?

A11. While at this residence, which of the following areas experienced flooding damage? (Exclude flooding caused by plumbing problems such as a leaking hot water tank.)
Check all that apply.

- | | |
|-------------------------------------------------------------|--------------------------------------------------------|
| <input type="checkbox"/> Basement | <input type="checkbox"/> Garages, Sheds, Out-buildings |
| <input type="checkbox"/> Crawl Space | <input type="checkbox"/> Land |
| <input type="checkbox"/> First Floor, if above ground level | <input type="checkbox"/> No Areas had Problems |
| <input type="checkbox"/> Second Floor | <input type="checkbox"/> Other (please describe below) |
- _____
- _____

A12. What was damaged? Check all that apply.

- | | |
|---------------------------------------------|--------------------------------------------------------|
| <input type="checkbox"/> Interior Contents | <input type="checkbox"/> Outside Property |
| <input type="checkbox"/> Interior Walls | <input type="checkbox"/> Other (please describe below) |
| <input type="checkbox"/> Building Structure | |
| <input type="checkbox"/> Outside Land | |
- _____
- _____

A13. How did the water enter your home?

Check all that apply.

- | | |
|---------------------------------------------------|--------------------------------------------------------------------|
| <input type="checkbox"/> Did not enter | <input type="checkbox"/> Seepage through cracks in walls or floors |
| <input type="checkbox"/> Through windows or doors | <input type="checkbox"/> Other (please describe below) |
| <input type="checkbox"/> Don't know | |
- _____
- _____

A14. Approximately how long was water present in your residence? _____ hours

A15. Approximately how long did it take for flood waters to recede from the ground outside your home?
_____ hours

A16. Have you experienced any of the following as a result of floods? Check all that apply.

☐ Forced to vacate residence. If yes, how long?

- _____
- | |
|--------------------------------------------------------|
| <input type="checkbox"/> Expense of lodging and meals |
| <input type="checkbox"/> Lost work days and lost wages |
| <input type="checkbox"/> Medical expenses |
| <input type="checkbox"/> Other costs (please describe) |
- _____

☐ Received government or private assistance (please describe below)

Section B. Self-Protection Measures

In this section we would like to learn about self-protection measures that you may have taken. Brief descriptions of various flood damage reduction measures are presented in the attached information pages, which are yours to keep.

81. What, if anything, have you or others done to flood proof this residence? **Check all that apply.**

- | | |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <input type="checkbox"/> Unaware of flood problem | <input type="checkbox"/> Applied sealer to basement or first floor walls and floor |
| <input type="checkbox"/> Aware of problem, but no preventive measures taken | <input type="checkbox"/> Permanently blocked basement windows and other openings |
| <input type="checkbox"/> Improved interior drainage | <input type="checkbox"/> Installed drainage tile around foundation or footing |
| <input type="checkbox"/> Installed check valve for utilities | <input type="checkbox"/> Installed removable flood shields |
| <input type="checkbox"/> Installed sump pump | <input type="checkbox"/> Improved drainage away from property |
| <input type="checkbox"/> Raised contents off floor | <input type="checkbox"/> Built permanent flood wall |
| <input type="checkbox"/> No longer use area for storage or living space | <input type="checkbox"/> Raised utilities to a higher level |
| <input type="checkbox"/> Raised lot and/or building elevation to place structure above flood level | <input type="checkbox"/> Used sand bags to block water |
| <input type="checkbox"/> Other (please describe below) | |
-

82. While at this present residence, how effective have been measures taken to reduce flood damage?

- ☐ Nothing has been done.
- ☐ No subsequent flooding has occurred.
- ☐ No lessening of flood damage.
- ☐ Minor lessening of flood damages.
- ☐ Moderate lessening of flood damages.
- ☐ Major lessening of flood damages.
- ☐ Flood damage eliminated.
- ☐ Flood damage has worsened.

83. Do you take any of the following emergency measures to minimize potential damages once storm conditions appear imminent? **Check all that apply.**

- ☐ Move items from basement to higher floor.
 - ☐ Move items from first floor to second floor or higher.
 - ☐ Move items from your house.
 - ☐ Evacuate your family from the building.
 - ☐ Move your car(s) to flood-free location.
 - ☐ Other (please describe below).
-

84. Have you even considered selling your residence because of flooding problems?

- ☐ Yes ☐ No

85. About how many hours of warning would you need to take emergency measures to protect your property?

_____ hours

86. Is your home within an area covered by some type of flood preparedness plan? **Check all that apply.**

- ☐ Unaware of any plan.
- ☐ Warning system.
- ☐ Temporary evacuation plan.
- ☐ Other type of storm preparedness plan.

(Please describe, including how you receive warning or notification.)

87. In the past, do you feel that adequate warning has been given prior to flood events?

- ☐ Yes ☐ No

88. Are you aware that flood insurance may be available from your insurance agent at rates subsidized by the Federal Government?

- ☐ Yes ☐ No

89. Are you currently participating in the National Flood Insurance Program?

- ☐ Yes

Have you received reimbursement for past flood losses?

- ☐ Yes ☐ No

- ☐ No

Do you intend to purchase flood insurance?

- ☐ Yes ☐ No

Section C. Preferences for Flood Damage Reduction Measures

The statements in Section C are intended to obtain information on your preferences for various flood damage reduction measures.

For each statement below, please check the response which most closely matches how you feel.

	Strongly Favor	Favor Somewhat	Neutral	Oppose Somewhat	Strongly Oppose
C1. Local government should regulate land use to reduce effects of flooding on future developments.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C2. Raise or replace seawalls along the shore.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C3. Move buildings from flood prone area(s) and relocate in non-flood area(s).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C4. Forbid further development of flood prone areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C5. Purchase and clear residences from flood prone areas and preserve these areas for parks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C6. Construct offshore breakwaters.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C7. Expand stone slope (riprap) on the ocean side of seawalls.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C8. Require flood proofing of flood-damaged buildings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C9. Develop a community-wide flood warning and evacuation plan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C10. Obtain information and guidance from the government on flood damage reduction measures which can be implemented by individual property owners.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C11. Houses should be raised above flood levels to prevent damage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C12. Improve drainage and pumping facilities within neighborhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C13. Expand measures to seal walls and/or floors and block openings such as doors and windows.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C14. Construct closure facilities, ringwalls, utility cells around properties and/or utilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C15. Expand flood insurance coverage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C16. None of the above flood damage reduction measures should be implemented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please return the completed questionnaire (keep the informational pages) in the enclosed stamped, addressed envelope. And thank you for your help.

APPENDIX B
COVER LETTER



DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDPL-IE

12 March 1981

Dear Roughan's Point Resident:

The New England Division of the Corps of Engineers is studying ways to reduce flood-related damages and hardships suffered by residents of your neighborhood. This is being done as part of the Revere Coastal Flood Protection Study, authorized by the Water Resources Planning Act of 1965 and a Congressional Resolution adopted 12 September 1969.

We feel that an important part of this study is communicating with citizens who are affected by flooding or who might be affected by possible flood damage reduction measures we recommend. Any plans we suggest to reduce flood damages should reflect your needs and desires.

The attached questionnaire and information primer is a first step in this communication process. Your responses will give Corps of Engineers planners information about:

- o Your experience with flooding.
- o Self-protection measures you may have taken.
- o Your preferences for flood damage reduction measures.

Individual questionnaires will be tabulated and published by type of response, not by names of individuals surveyed. All responses will be kept in our files as back-up data; after 10 years they will be retired to the Federal Records Center as part of the Flood Plain Management Services Study Files.

Completing and returning this questionnaire is, of course, voluntary. Your prompt response will provide us with important information on community views on the flooding question. Please return your questionnaire by April 1, if you wish to have your responses included in our analysis. The Corps of Engineers will hold a Public Workshop by early May to review results of the flood protection study with you. This Workshop will give you a chance to ask questions, discuss concerns, and address existing or additional flood protection issues.

Please return your completed questionnaire in the enclosed self-addressed, stamped envelope. You may keep the information brochure. If you have any questions, please contact Joseph Bocchino, project manager of the Revere Coastal Flood Protection Study, at the Corps of Engineers, 894-2400, extension 538 or 546. Thank you for your cooperation.

Sincerely,

C.E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As Stated

APPENDIX C
INFORMATION BROCHURE

FLOOD DAMAGE REDUCTION MEASURES

INFORMATION BROCHURE

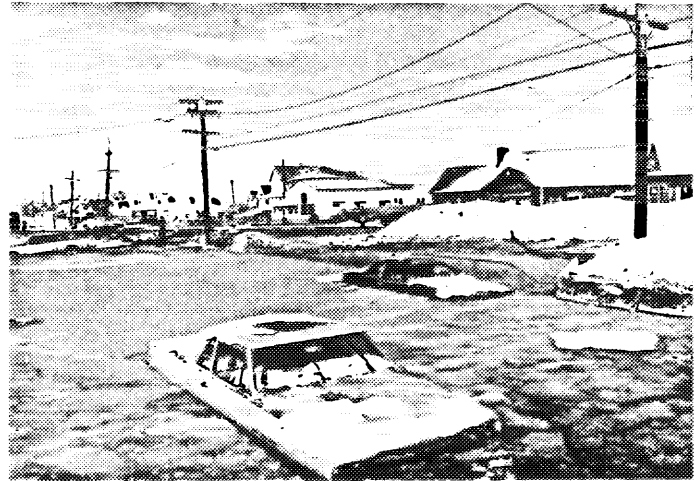
BLIZZARD OF '78

The blizzard and coastal flood of February 6-7, 1978, ranks as the most damaging weather event to strike the northeastern seaboard of the United States since March 1962. Remembered as the "Blizzard of '78," it was one of the worst national disasters in the history of the country.

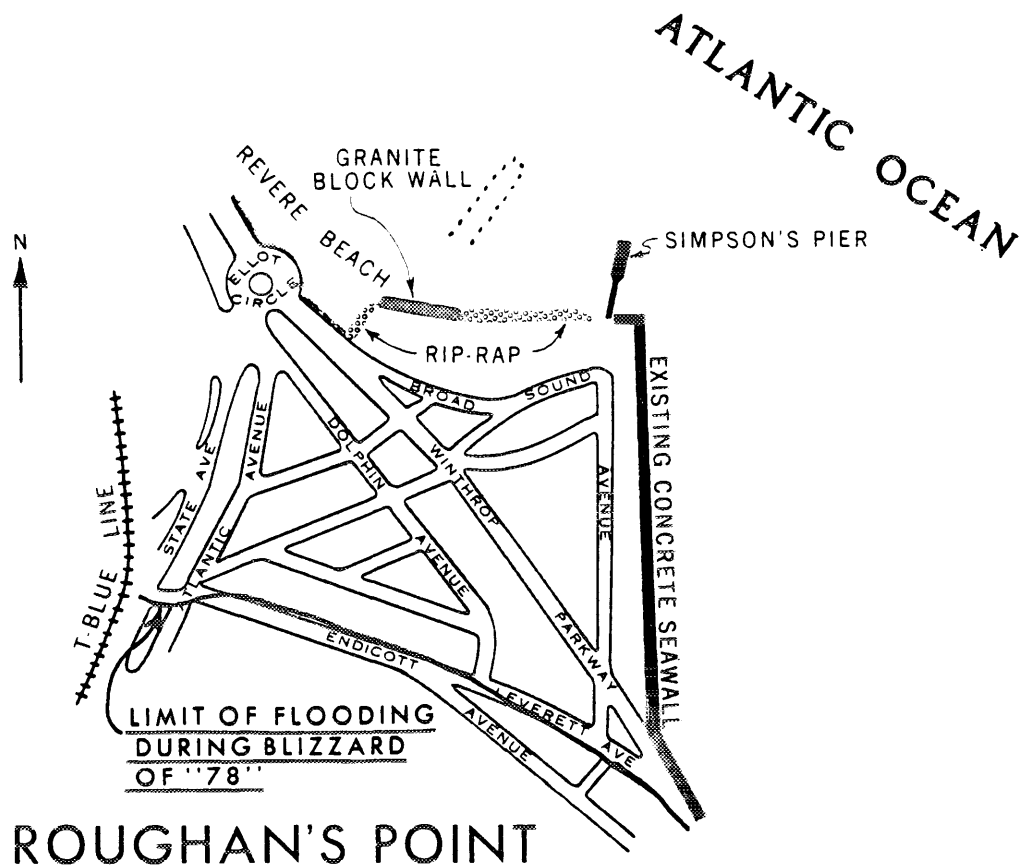
The storm featured both extraordinarily high winds and record tides, which combined to cause major flood damage in coastal areas—including the Roughan's Point area of Revere, MA. Wind speeds as high as 92 miles per hour were recorded in the area, and tides in some areas were two feet higher than any other tidal surge on record.

Available estimates of major damages caused by the storm include:

- Twenty-nine lives lost in Massachusetts.
- Damages of \$14.3 million in Revere alone.
- Damages of \$10.3 million to residential structures.
- More than 1500 homes damaged in Revere.
- More than 250 homes affected in Roughan's Point.



During the Blizzard of '78, Winthrop Drive in the Beachmont Section of Revere, MA, was flooded by waves and tidal surge that overflowed the seawall. (photograph courtesy of The Boston Globe)



Map of Roughan's Point shows areas flooded during Blizzard of '78.

FLOOD DAMAGE REDUCTION MEASURES

The purpose of the Coastal Flood Protection Study is to prepare a plan for reducing flood damages. The plan may include a variety of flood damage reduction measures. The challenge is to produce a plan to include those measures which are:

1. Effective in reducing damages.
2. Economically feasible.
3. Acceptable to those who will be most affected by implementation of the plan.

Alternative measures to reduce flood damages are often grouped into two categories: (1) structural measures, and (2) nonstructural measures.

Structural Measures

Structural flood damage reduction measures generally involve construction of engineering works which provide flood protection to an entire community or neighborhood. These measures deal with the flood waters rather than with the land and properties being protected.

- **Seawalls** are structures placed at the shoreline to protect the land and properties from damage by waves. Often constructed of concrete, a seawall's design can be developed to suit different non-flood uses such as boat mooring or access to beaches.
- **Riprap** or expanded stone slopes on the ocean side of seawalls is used to withstand severe wave action. Although scour of the fronting beach may occur, the rock can keep the seawall from failure. Large riprap can be difficult to climb over for persons trying to get nearer the water.



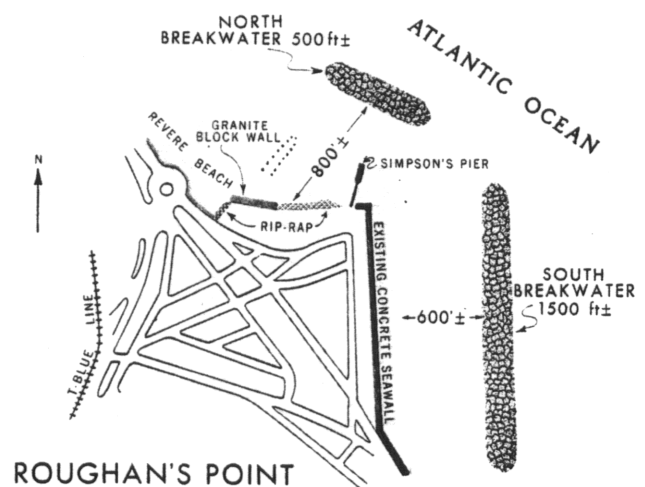
Seawalls with riprap help protect shore from flooding and wave damage.

- **Improvements of drainage and pumping facilities** within a neighborhood hit by flooding can minimize the extent and duration of flooded basements and backshore properties.
- **Sand dunes and expanded beaches** are important shore protection formations. Dune ridges along a coast prevent movement of storm tides and waves into inhabited areas. Beaches of suitable dimensions are effective in dissipating wave energy. Protective dunes and beaches can be built with land-hauled sand fill or by pumping sand from offshore, using a floating dredge and pipeline.



Breakwaters reduce wave action on shoreline.

- **Offshore breakwaters** are structures designed to protect an area from wave action. In combination with shoreline seawalls, offshore breakwaters provide a first line of defense. They can be sited to provide harbor shelter or other beneficial purposes.

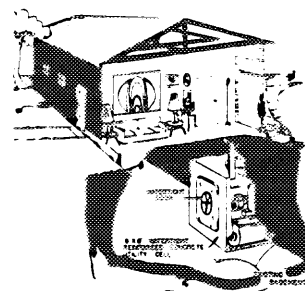


Plan for flood protection includes offshore breakwater possibly located as shown.

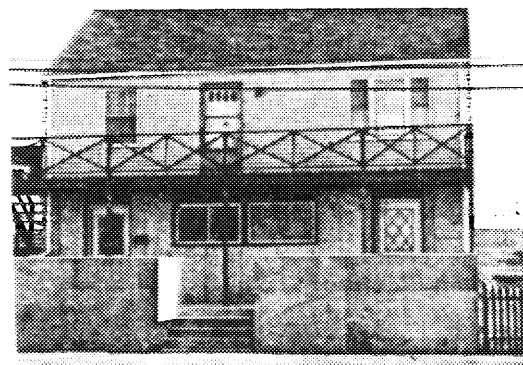
Nonstructural Measures

Nonstructural measures are applied to individual properties or to the land in or around a community. Often, these measures are implemented by the individual property owner or through local community action. A brief description of a number of nonstructural flood damage reduction measures follows.

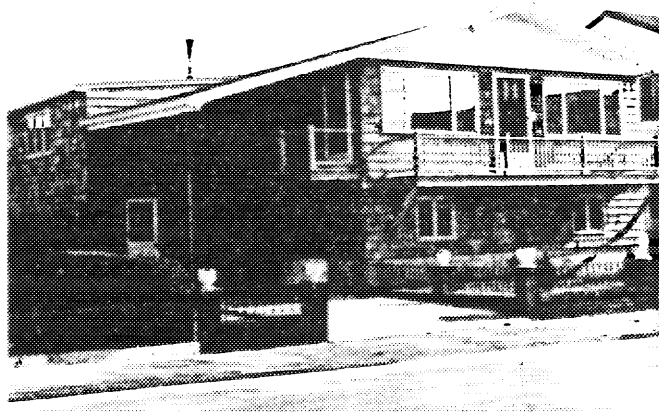
- **Floodproofing** includes several types of measures which can be applied to existing or new buildings.
 - Watertight closures installed in doors and windows can keep water out of a building.
 - Sealant applied to building and basement walls can reduce seepage into a building.
 - Check valves on sewer pipes and floor drains can prevent sanitary and drainage water backflow.
 - Sump pumps can remove seepage which may occur.
 - Utility cells are reinforced concrete areas housing appliances and/or mechanical and electrical items.
 - Construction of small walls or levees around the building can keep flood waters out.



Utility cells protect expensive appliances.

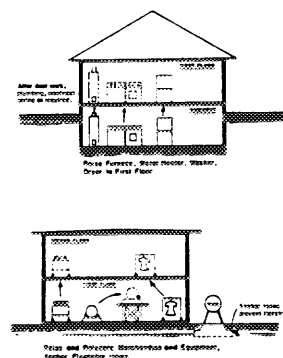


Small walls around property keep flood waters out.



Raising a building above flood level is a means for reducing damages.

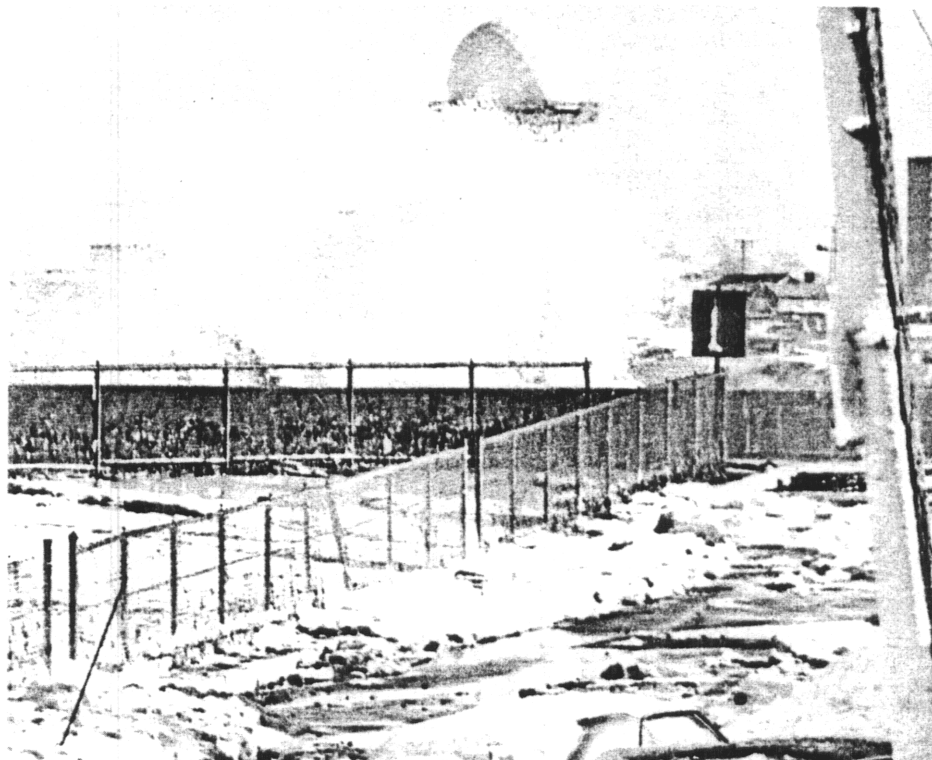
- **Raising** an existing or new building to an elevation above projected flood levels is sometimes used for buildings located in flood hazard areas. The methods used differ and depend upon aesthetics, the type and use of the building, available construction materials, and the type of flood hazard. Commonly used materials include earth fill, concrete walls, and wood, steel or concrete piers. Many homes in your neighborhood have already been raised.



Rearranging damageable property within building can be an effective, low-cost damage reduction measure.

- **Rearranging or protecting damageable property** within an existing building is often possible. It is something every property owner can do to some degree depending upon the severity of the flood hazard. Large household and commercial items, such as furnaces, water heaters and merchandise can be rearranged as a permanent precaution. Transportable items, such as automobiles, can be moved just prior to a flood if ample warning time is provided.

- **Flood Forecast, Warning and Evaluation** is a strategy to reduce flood losses by charting a plan of action in response to a flood threat. The strategy includes:
 - A system for early recognition and evaluation of potential floods.
 - Procedures for issuing and disseminating a flood warning.
 - Arrangements for temporary evacuation of people and property.
 - Provisions for installing temporary protective measures.
 - A means to maintain vital services.
 - A plan for post-flood reoccupation and economic recovery of the flooded area.
- **Building and Housing Codes** sometimes require the use of floodproofing materials when flood damaged properties are repaired or new buildings built. Building codes can reduce flood damages to structures by setting specifications to:
 - Prevent flotation of buildings through proper anchorage.
 - Establish minimum floor level elevations consistent with flooding potential.
 - Restrict use of materials which deteriorate when exposed to water.
 - Require structural design consistent with water pressure and flood velocities.
- **Zoning and Subdivision Regulations** can guide land use in flood hazard areas through restrictions on types of particular land uses, specifying where uses may be located, and establishing minimum elevation on floodproofing requirements for the uses. These regulatory means are directed principally to future growth and can be implemented as part of a community-wide development plan.
- **Flood Insurance** does not directly reduce flood damages but compensates a policy holder for financial losses suffered during a flood. The National Flood Insurance Program provides for subsidized rates to policy holders in communities designated by the Federal Insurance Administration as participating communities according to the rules and regulations of the Program. In general, the Program requires community regulation of floodplain land and elevation of structures above flood levels.
- **Public Acquisition and Relocation** of flood hazard lands and/or damaged properties and conversion to desired public uses is intended to eliminate recurring damages. Preservation of open space and development of parks are two common public uses for floodplain land. Damageable structures can be moved, razed, or converted to a compatible use. Acquisition can be used as part of a continuing community development program.



During the Blizzard of '78, water from waves overtopping the seawall runs down Leverett Avenue in Revere, MA. (photograph courtesy of The Boston Globe)

APPENDIX D
WORKSHOP SUMMARY

Summary results of the social survey described in detail in this report were presented at a COE-sponsored Workshop on May 27, 1981, in the Roughan's Point area of Revere, Massachusetts. Workshop objectives, in addition to the first public presentation of the flood survey results, included:

- Obtaining reaction to four flood protection plans presently being considered by COE planners.
- Obtaining direct citizen input by a question and answer period.

The May Workshop was first announced in a letter dated March 12, 1981, which accompanied the survey sent to Roughan's Point residents (see Appendix B). Letter announcements/invitations to a "Citizens' Advisory Group Workshop" were sent by the COE to the following groups and persons in Revere:

Revere Fair Share 270 Broadway % M. Brown	Planning & Community Development Revere City Hall 281 Broadway	Revere Growth Policy Committee Mrs. L. Carifio 314 Reservoir Ave.
Pines Riverside Assoc. 157 Mills Ave. % M.C. Duffy	Mrs. Edith Ziskind 71 Jones Rd.	Mr. Frederick Sannella City Councilor 36 Goodwin Ave.
Mr. Alexander L. Moschella 200 Winthrop Parkway	Revere Chamber of Commerce 234 Lincoln St. % R. Dalton	Mrs. Rita Singer City Councilor 14 Bellingham Ave.
Revere Beach CAC 10 Pierview Ave.	Robert Haaf, Jr. City Councilor 155 Fenley St.	Father Bretta Our Lady of Lourdes Hall 1 Endicott Ave.
Mrs. Dorothy Scholwin 156 Broadsound Ave.		

A copy of this letter is included here as Figure 1. Many of the approximately 70 Workshop participants, however, were individual Roughan's Point residents and homeowners with vivid memories of the Blizzard of '78 and other floods.

Two members of CEM's professional staff participated in planning for and carrying out the Workshop. Dr. Lynn Johnson, Principal Investigator for the Roughan's Point Social Survey, introduced Workshop panel members and served as recorder during the question and answer period. Ms. Kayla Costenoble, a member of the survey project staff, gave an illustrated briefing of the survey results. These results were also made available to Workshop participants in the form of a two-page handout, shown here in Figure 2.

Mr. Joseph Bocchino, COE project manager of the Revere Coastal Flood Protection Study:

- Outlined the areas's flooding problems, using slides to show past damage and present protection measures.
- Discussed the alternative plans currently being considered by the COE.
- Moderated the question and answer period, which occupied about one and one-half hours of the two hour Workshop.



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDPL-BC

20 May 1981

SUBJECT: Revere Coastal Flood Protection Study - Citizens' Advisory Group
Workshop

TO: Citizens' Advisory Group

The New England Division (NED), Corps of Engineers, invites you to participate in a workshop meeting on the Revere study, currently focusing on planning at Roughan's Point. The workshop will be held at the Our Lady of Lourdes Hall at 1 Endicott Avenue, in Revere, Massachusetts, on Wednesday, 27 May 1981, from 7:00-9:00 p.m.

Last month, the residents of Roughan's Point received an information brochure describing several flood damage reduction measures being studied by NED. Also, a survey questionnaire regarding flooding experience, flood protection measures taken, and preferences for future flood control alternatives was distributed with the brochure.

Currently, planning efforts at Roughan's Point have been concentrating on the following:

Plan A - raising the existing walls and dikes.

Plan B - a nonstructural approach including floodproofing, warning and evacuation, and administrative actions.

Plan C - improving the existing walls and dikes by adding a rock berm on the seaward side.

Plan D - constructing an offshore breakwater.

The purpose of the workshop is to present the survey results and their interpretation toward the planning effort. Also, this meeting will provide a forum for your direct input into evaluation and assessment of the above plans.

We are looking forward to seeing you at the meeting. Please bring this announcement to the attention of anyone you know who may be interested in attending the meeting.

Sincerely,

for Joseph L. Ignazio
JOSEPH L. IGNAZIO
Chief, Planning Division

Figure 1. Letter sent to citizens' advisory groups announcing workshop to present flood survey results and discuss future plans for Roughan's Point.

ROUGHAN'S POINT SOCIAL SURVEY REVERE COASTAL FLOOD PROTECTION STUDY

OBJECTIVES

- Flooding Experience
- Self-Protection Measures
- Preference for Flood Damage Reduction Measures

SCOPE

- Mailed Questionnaire
- Included Information Brochure with Questionnaire
- Sent to 465 Resident Addresses
- 29% (137) Returned Questionnaires

RESPONDENT CHARACTERISTICS

- Home Owners (80%)
- Long-Time Residents (17 years average)
- Year-Round Residents (99%)
- Older Buildings (50 years average)
- Single Family Homes (63%)

FLOODING EXPERIENCE

- Flooded at least Once (90%)
- Blizzard of '78 Worst Experience (85%)
- Extensive Damage to First Floor Living Areas (50%)
- Evacuated from Homes (89%)
- Received Relief Assistance (85%)

Figure 2. Summary of Social Survey presented at Workshop and given to participants.

SELF-PROTECTION MEASURES

- One or More Self-Protection Measures Taken (90%)
 - Raised Utilities (35%)
 - Raised Buildings (21%)
- Many Have Considered Selling Their Home (55%)
- Need More Than 2 Hours Warning (80%)
- Feel Inadequate Warning Given (56%)
- Participate in Flood Insurance Program (83%)

PREFERENCES FOR FLOOD DAMAGE REDUCTION MEASURES

- Structural Measures Favored (92%)
- Many Also Favor Community Nonstructural Measures (72%)
- Majority Favor Individual Nonstructural Measures, also (58%)
- Purchasing and Clearing Land a Controversial Option

We have used the CEM recorder's notes together with written notes made during the Workshop and have grouped participants' comments/questions and COE answers/explanations into four basic areas:

- A. Flooding Experience
- B. Structural Plans
- C. Nonstructural Plans
- D. Planning Process

In addition, to differentiate between audience participants and the COE, all COE remarks (made by Mr. Bocchino) are identified and appear in a different type face.

A. FLOODING EXPERIENCE

1. General

- Thank the Lord we're still alive.
- Any normal nor'easter causes flooding.
- COE: *Annual losses to Roughan's Point are about 1.2 million dollars, or about \$3700 a house.*
- Water overtops sea wall and rolls down BROADSOUND and Leverett Avenues--is a flooding source.
- "We've had it with flooding!"
- What about study done by COE in 1970?
COE: *Based on damages caused by flooding up to then, not economically feasible for COE to build. Severe flooding since then changes that.*
- Old study should have predicted what might happen in future. Should have been able to foresee flooding.
- Paul Rump, city of Revere community development: City of Revere accepted the 1970 report that COE construction would not be cost effective, but now "a dead study has come back to life."

2. Present Protection

- North seawall not high enough.
- Wall overtopped on south end.

3. Pumping Station

- Poor drainage and pumping in '78.
- Sewers fill up first.
- Local drainage from hills causes flooding.
- Station inadequate and needs additional pipes.
- Station is an expenditure wasting tax payers' money, compared to a "mosquito trying to kill an elephant."

B. STRUCTURAL PLANS

- Best alternative is one which will keep water out (as opposed to flood proofing).
- How much does each structural plan cost?
COE: We will have those figures for public meeting in late June. Breakwater (Plan D) most expensive plan; will cost 10-15 million dollars.
- 10-15 million dollars not so much when you consider how much has already been spent.
- How long will walls last?
COE: Our plans call for designs to last at least 100 years.
- Breakwater not long enough; 3500 feet not enough; should extend further.
- *COE: All plans provide equal protection. Breakwater elevation proposed about the same as seawall elevation.*
- We're afraid of flooding before any plan implemented.
- *COE: All plans include drainage and pumping improvements.*
- L. Johnson: All structural plans (A,C,D) involve berm and loss of beach in front of wall.
- *COE: Berm improves shellfish.*
- Note: Plan D seemed preferred by a voice vote and a show of hands vote.
- *COE: COE will keep all plans; will indicate people seem to prefer Plan D.*

C. NONSTRUCTURAL PLANS

- Federal government has "loaned" 20 million dollars to Revere in total.
- Although emergency funds have been spent, no permanent solution has been proposed.

National Flood Insurance Program

- Program is ambiguous; needs improvement.
- Revere currently has only one zone for insurance rates.
- *COE: Separate rates to be established by zones. Engineering study now going on (not by COE); may result in four separate flood zones and separate rates. Federal Emergency Management Agency department responsible for flood insurance.*
- Revere not yet on "regular" insurance program, still on "emergency" program.

D. PLANNING PROCESS

- *COE: Normal planning process: Stage 1: Reconnaissance
Stage 2: Feasibility (we are here now.)
Stage 3: Final Plan*
Local support important; congressional support important. Residents, local officials and those who can push it (reference is to Plan D) through the Senate have to get together.
- Councilor Rita Sanger: "Starting tomorrow" will work with other councilors to develop a resolution asking for emergency action for Roughan's Point. Plans to involve city council, state and Federal officials.

- COE: *Emergency construction only for plans costing less than 3 million dollars.*
- We want action. Citizen suit possible.
- Legal problems with beach. "We use our beach; we own our beach."
- Need to keep residents informed. Found out about this Workshop at very last minute.
- COE: *Approval process long and complicated; takes 5-9 years, but is being accelerated for Revere. Should be at Stage 3 by end of 1981.*
- "We need help now--not tomorrow, but yesterday." If it takes 15 million dollars to build this project, it's worth it. Do the project once and for all and do it right!